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Benefits of agricultural and forestry machinery standardization in Finland

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Abstract

The goal of this research project was to evaluate the benefits of agricultural and forestry machinery standardization amongst companies and other stakeholders in Finland. The research project was carried out by a questionnaire study to enterprises and other organizations involved. Some questionnaires were also sent to European standardization bodies.

The results of the study showed that the benefits of standardization have been realized in the agricultural and forestry machinery sector, and manufacturers acknowledge the important role standardization plays in their work. It was established through the questionnaire that standards when adopted systemically place companies on the benefiting end and to some extent cause positive competition on the agricultural and forestry machinery market. All respondents agreed that safety standards clarify safety requirements of products and safety standards reduce accidents when machines and implements are used. Furthermore, 89 % of respondents were of the opinion that standards help in protecting the environment.

The present way of organizing and financing agricultural and forestry machinery standardization in Finland was acknowledged by almost all the responding companies to be very convenient and yield good results. However, there are certain problems that companies face when using standards. These shortcomings must be improved.

The companies and organizations pointed out that language and therefore the understanding of the technical contents of standards was a typical problem for most of them. A lot of companies will benefit, if there are translations of proposed standards during the inquiry stage rather than only when the standard are published. Generally, there is very low participation in standardization by smaller (SME) agricultural and forestry manufacturing companies in Finland. Almost all of the companies who stated that they do not have the necessary resources for obtaining information of the standards, were SME's. In terms of standardization activity in the sector, SME's must be encouraged to take active part in standardization work. About 70 % of the respondents of the questionnaire indicated that standardization is slow. The standardization organizations have already noticed this and for example changes have been made in CEN concerning standards preparation time.

The results of this study affect probably the future competitiveness of the agricultural and forestry machinery industry both on the domestic and export markets.

Index words: standardization, benefit analysis, agricultural machines, forestry machines

Maa- ja metsätalouskoneiden standardisoinnin hyödyt Suomessa

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Tiivistelmä

Tämän tutkimuksen tavoitteena oli arvioida maa- ja metsätalouskonealan standardisoinnin hyöty konevalmistajille ja muille yhteistyötahoille. Tutkimus toteutettiin yrityksille ja muille organisaatioille suunnattuna kyselynä. Lisäksi tehtiin joitakin kyselyjä Euroopassa.

Tutkimuksen tulokset osoittavat, että standardisoinnin hyödyt on hahmotettu maa- ja metsätaloussektorilla ja valmistajat pitävät standardisointia tärkeänä työssään. Standardien systemaattinen hyväksikäyttö yrityksissä antaa yrityksille positiivista kilpailuetua maatalous- ja metsäkonemarkkinoilla. Kaikkien vastaajien mielestä turvallisuusstandardit selventävät tuotteiden turvallisuusvaatimuksia ja ne myös auttavat vähentämään onnettomuuksia koneita ja laitteita käytettäessä. 89 % vastaajista oli sitä mieltä, että standardisointi auttaa ympäristön suojelussa.

Nykyistä maa- ja metsätalouskoneiden standardisointijärjestelmää pidettiin ajanmukaisena ja tuleviin haasteisiin hyvin vastaavana. Myös standardisointijärjestelmän rahoitusta pidettiin ajanmukaisena. Järjestelmässä on kuitenkin joitakin epäkohtia, joihin tulisi vaikuttaa.

Useimpien yritysten ja organisaatioiden mielestä standardien teknisen sisällön ymmärtäminen pelkästään englannin kielellä tuottaa usein vaikeuksia. Siksi pidettiin tärkeänä, että standardista laaditaan käännös suomen kielelle mahdollisimman varhaisessa standardin käsittelyvaiheessa. Pienet ja keskisuuret yritykset seuraavat standardisointityötä ja ottavat itse osaa standardisointityöhön isoja yrityksiä harvemmin. Siksi niitä tulee rohkaista osallistumaan työhön selvästi nykyistä aktiivisemmin. Noin 70 % vastaajista piti standardisointityötä hitaasti etenevänä. Tähän on jo kiinnitetty huomiota standardijärjestöjen toimesta ja mm. CEN on virtaviivaistanut standardien käsittelyn.

Tutkimuksen tuloksia voidaan hyödyntää koko maa- ja metsätalouskoneteollisuuden kilpailukyvyn turvaamiseksi.

Asiasanat: standardisointi, hyötyanalyysi, maatalouskoneet, metsätalouskoneet

Foreword

The membership of Finland in the European Union and the global networking emphasize the importance of standards to Finnish companies and the society as a whole. The Council of the European Union urged on its resolution that public authorities should examine how the viability of the overall standardization system and its finances in their nations, can best be guaranteed in the light of the rapidly changing European and International environment. If necessary, the authorities should finance and take part in the standardization processes.

The need for standardization work is increasing because of globalization. With this progress society's political and social responsibilities grow. The need is also visible when the society is developing into a network and knowledge society; growing service sector, integration of technologies and the shortening of products life cycles.

In the future standardization will affect among other things the society's export and import trade, workers occupational health, the safety of products and the environment.

The benefits of standardization in agriculture and forestry can be found on other hand as a support to the Finnish agricultural and forestry machinery industry in the form of competitive advantage and on the other hand as suitable and safe machinery for farmers. Typical of the Finnish agricultural and forestry machinery industry is the big amount of small and medium size enterprises (nearly 800 places of business). In 2002 the gross production value of the agricultural and forestry machinery industry was about 900 M€ of which 500 M€ were exported. Finnish enterprises hold a remarkable sales share on European machinery markets compared to the country's size. The agricultural and forestry machinery industry employs about 4 000 people mainly in the countryside and thus greatly increases the vitality of rural communities. Efficient standardization work is substantial when developing the sector's competitiveness both in domestic and export markets. By the help of standards, manufacturers' attention is drawn to the requirements of machinery placed on the export markets and for that matter demands that suit Finnish conditions. Standardization work aims at the future in a 3-10 year's arc. By influencing the future this way, standardization affects the farmer's future technological solutions.

The goal of this research project was to find out the benefits of standardization in agricultural and forestry machinery sector. We found out in this research project how and at what level standardization should be done in the future. We hope that this research project will affect the future competitiveness of the agricultural and machinery industry both in domestic and export markets.

We thank most sincerely all the enterprises and organizations that took part on this research project.

Frederick Teye, Jukka Manni and Pekka Olkinuora

Esipuhe

Suomen jäsenyys EU:ssa sekä yleismaailmallinen verkottuminen korostavat standardien merkitystä suomalaisille yrityksille ja koko yhteiskunnalle. Mm. Euroopan unionin neuvosto on kiinnittänyt huomiota standardisointityön tärkeyteen päätöslauselmassaan ja pyytänyt, että viranomaiset huolehtivat omalla hallinnonalallaan standardisointityön puitteista kansallisella rahoituksella ja tarvittaessa osallistuvat standardisointiprosessiin.

Standardisoinnin tarve korostuu tulevaisuudessa mm. yhteiskuntapoliittisten ja sosiaalisten vastuiden lisääntyessä kun yritysten toiminnat laajenevat maailmanlaajuisiksi. Tarve näkyy myös yhteiskunnan verkottumisessa ja tietoyhteiskunnan kehittymisessä; palveluala kasvaa, teknologiat integroituvat ja tuotteiden elinkaaret lyhenevät.

Standardisointi tulee vaikuttamaan yhteiskunnan tasolla mm. kotimarkkina- ja vientikauppaan, työntekijöiden työturvallisuuteen ja -terveyteen, kuluttajille tarjottavien tuotteiden turvallisuuteen ja ympäristöön.

Maatalouden konesektorilla standardisoinnin suora vaikutus näkyy toisaalta tukena suomalaiselle maa- ja metsätalouskoneteollisuudelle selkeänä kilpailuetuna ja toisaalta viljelijöille tarkoitukseen soveltuvina turvallisina koneina. Luonteenomaista suomalaiselle maa- ja metsätalouskoneteollisuudelle on pienten ja keskisuurten yritysten suuri lukumäärä (noin 800 toimipaikkaa). Tuotannon bruttoarvo vuonna 2002 oli noin 900 M€. Vienti oli noin 500 M€. Suomalaisilla yrityksillä on maan kokoon nähden huomattava osuus EU:n maa- ja metsätalouskonekaupassa. Maa- ja metsätalouskoneteollisuus työllistää noin 4000 henkilöä lähinnä maaseudulla ja siten lisää suuresti sen elinvoimaisuutta. Tehokas standardisointityö on oleellista pyrittäessä kehittämään teollisuudenhaaran kilpailukykyä sekä kotimaan että vientimarkkinoilla. Standardien avulla valmistajat osaavat ottaa huomioon vientimarkkinoilla tarpeelliset koneiden vaatimukset ja toisaalta standardisoinnin avulla koneille (myös tuontikoneille) saadaan asetettua Suomen olojen mukaiset vaatimukset, jotka suoraan vaikuttavat koneiden käytettävyyteen. Standardisointityö tähtää tulevaisuuteen 3-10 vuoden tähtäimellä. Tällöin vaikuttamalla tulevaisuuteen vaikutetaan maatilojen tulevaisuuden kokonaisvaltaisiin teknologisiin ratkaisuihin.

Tämän tutkimuksen tavoitteena oli selvittää maa- ja metsätalouden sektorilla tehtävän standardisointityön hyöty. Tutkimuksessa määritetään maa- ja metsätalouden sektorilla tulevaisuudessa tarvittavan standardisointitoiminnan taso ja yhteistyökumppanit. Vaikuttavuus kohdistuu erityisesti maa- ja metsätalouskoneteollisuuden kilpailukykyyn sekä kotiettä vientimarkkinoilla.

Kiitämme kaikkia tutkimukseen osallistuneita yrityksiä ja organisaatioita.

Frederick Teye, Jukka Manni ja Pekka Olkinuora

Contents

1 Introduction

The realization of the importance and benefits of standardization took place a long time ago. National standardization in Finland was initiated by the Engineering Machinery Manufacturers Association (Konepajainsinööriyhdistys) in 1922. At the constitutive meeting of the national standardization board in 1924, a proposal was made to fit, if possible the products of Finish industries according to the conditions of international trading countries for the benefit of the general industry. Early efforts were made to give information about the purpose and benefits of standards for example in the annual reports of the national standardization organization after its establishment (Kaartama 1984). In the field of agricultural machinery, the first standards concerning agricultural implements were published in 1930 by the then national standardization association in Finland currently known as the Finnish Standards Association SFS (Olkinuora 1987).

Standardization has been acknowledged to have an effect on the industry, the citizens and the government of every nation (CEN 2002). A statement from the 1947 annual report of SFS says, " Standardization is a fight against the biggest problem of welfare spending, this spending can be found in the form of time, money, raw materials, work and labor. Especially under Finnish national conditions, standardization is a poor man's weapon for achieving better living standards. It is a road to better welfare of the people" (Kaartama 1984). A well functioning standardization body is crucial in the promotion of growth of the economy. In many instances standards efficiently take care of established technology and this allows resources to be focused on innovation. In this way, standardization helps to increase competition and for that matter lower output and sales costs, benefiting the economy as a whole (DIN 2000). Unfortunately, the real benefits of standardization are not easily noticed or appreciated unless they are lacking in our daily lives (Temple & Williams 2002). Without standardization, it will be very difficult for the farmer to connect the power take-off (PTO) of the tractor to farm machines and implements or in the first place, have the right direction and speed for smooth operation of agricultural implements.

Various factors have combined to make standardization become an important in the agricultural and forestry machinery manufacturing industry. Some decades ago, active participation in standardization was a reserved field for a few specialists. Presently, standardization is regarded as an essential discipline for all players within the economy. The parties' involved endeavour to master the motivating forces and implications surrounding standardization to attain the best out of it. Furthermore, due to the importance of standardization, companies have integrated standards as a major technical and commercial element into their operations. Companies have also become aware that they must play an active role in this field, or then be prepared to accept standardization established without them, or without the consideration of their interests.

The membership of Finland in the European Union (EU) emphasizes the importance of standards to Finnish companies and the society as a whole. The Council of the European Union on its 10th October 1999 resolution, urged national standards bodies and public au-

thorities to examine how the viability of the overall standardization system and its finances in their nations, can best be guaranteed in the light of the rapidly changing European and international environment. In addition, Finland being a member of GATT (General Agreement on Tariffs and Trade) since 1950, through the transformation to WTO (World Trade Organization) in 1995 has a great task of continuously shaping national standardization to improve regional and international cooperation and trade (WTO 2003). In inter-country trade, national technical specifications, which differ from one country to the other, were used to partly protect country's domestic markets and industries consciously from foreign competitors by imposing various tariffs. Currently, tariffs have been largely eliminated from world trade (FAFO 1992, WTO 2003). The directives based on the "New Approach" made under Article 95 of the EC treaty specify health, safety and other requirements of products in broad terms. Thus, although the application of the standards to products remains voluntary, European policy on technical barriers is inextricably bound up with standardization (EU 2000a). This spells out the importance of standardization to manufacturers, marketers, consumers and to players in the service sector. It was also noted by Temple & Williams (2002) that standards collection, which considers international requirements, assists both internal and external trade. A purely national collection may not only frustrate international trade, but may even create a competitive disadvantage within the economy. This brings to mind the fact that to ensure a standardization that will benefit all, the effects and interrelation between innovation and patents, international trade, safety and the environment, demands and the consumer, litigation, technicalities and developmental trends, and the production industry, to mention a few has to be taken into consideration in the standardization process.

Today, the benefits of standardization have been realized in the agricultural and forestry machinery sector, and manufacturers acknowledge the important role standardization plays in their work. This is the general perception of most people. The MTT Agrifood Research Finland (Vakola), initiated this research to look into the benefits of agricultural and forestry machinery standardization amongst companies and other stakeholders in Finland. The literature research and outcome of the research is published in the following report.

2 Objective of study

The objective of this study is to clarify the benefits of standardization work to the agricultural machinery sector in Finland. The study seeks to obtain manufacturers perception about standards and the benefits they obtain from them. The study reviews the trends in agricultural and forestry machinery standardization in Europe and the benefits obtained for standardization related to machinery in general.

The study aims at obtaining information about the benefits of standardization in the area of agricultural and forestry machinery through a literature review and questionnaire enquiries. Through a domestic research questionnaire in Finland, views about the organization of standardization are obtained from companies who use agricultural and forestry machinery standards. Information about agricultural and forestry machinery standardization in some

selected countries in Europe is also obtained through an international questionnaire and the results presented alongside standardization practices in Finland.

Finally, this research will also point out some of the shortcomings in agricultural and forestry machinery standardization from the users point of view. The wishes of the users of agricultural and forestry machinery standards for organizing standardization work in future will also is also addressed in this research.

3 Literature review

A number of researches and publications have been done concerning the benefits of standardization. Three of these research publications that have been referred to in this report include the following. The *first* is a recent CEN (European Committee for Standardization) publication of a study by the economists; Temple and Williams from the UK in 2002. The book describes the key role of standards to create markets, to assist innovation and encourage investment. The following are some points noted in the book:

The CEN publication indicated that there has been little research on the overall benefits of standards to the society, but what there is, is very supportive of the view that standards provide major benefits to the society. The book also stated that standards function by reducing variety, ensuring interoperability, maintaining, and providing information. These functions together, form part of an interlocking systems of standards, which are a vital element in the infrastructure supporting markets. Whilst industry is a major beneficiary of standards activity, standards play a major role in ensuring that competition prevails. Some other points that the publication made are that modern standards bodies aim to reflect the needs of the key stakeholders: industry, citizen, government and the constituencies that the government seeks to represent. These constituencies may include the environment and the well being of the future generations. The publication also stressed that governments need to consider standardization policy as sitting alongside innovation and competition policy and accept some responsibility for the health and vitality of the standards infrastructure as a whole.

The *second* publication on “the economics of standardization” by Swann Peter from the Manchester Business School is published by the Department of trade and Industry (DTI) in 2000 in the UK. The publication stressed that standardization is a key part of the micro-economic infrastructure, thus, it can enable innovation and act as a barrier to cause undesirable outcomes. Standardization does constrain activities but in doing so creates an infrastructure for subsequent innovation. Well-designed standards should be able to reduce undesirable outcomes. Moreover, standardization is not just about producing norms for given technologies in given markets. Standardization helps to enhance credibility and focus on markets of new technologies. Companies can reduce costs and increase quality through standardization. They can reduce the risks they face - both technological risks and market risks. Participants can learn much from their fellow participants. Standardization also increases competition, which does not necessarily increase profitability of all companies. However it is in the interests of the economy as a whole. Standardization increases the vol-

ume of trade, increasing imports as well as exports, and makes an important contribution to macroeconomic growth.

The second publication also states that like the "hard" infrastructure (such as roads and railways) there is a strong public good element to the standardization infrastructure. However it is clear that traditional public standards setting procedures are under pressure. It is widely perceived that they are not "fast enough". Intense global competition and rapid rates of innovation have lead to ever-shorter product life cycles. This has created a competitive imperative to define standards quickly and that has put formal standards bodies under great pressure. The DTI publication also pointed out that uneven representation in the standardization process can lead to shortsighted standards. The "ideal model" for the involvement of national standards bodies and government in the standardization process has two components. The first is to correct the typical imbalance in participation and the second component is to keep the standards infrastructure in "good shape".

The *third* is a publication by The German Institute for Standardization (DIN) on a study to determine the value of standardization to corporations (DIN 2000). The study was developed from questionnaires sent to over 4,000 companies in 10 industry sectors, selected at random in Germany, Austria and Switzerland. The final report on that study, entitled “The Economic Benefits of Standardization,” is available in English from the DIN website http://www.din.de/aktuelles/benefit.html. The following are quotes that are made in the report:

1. “*Companies are generally unaware of the strategic significance of standardization”*. Although the persons involved in the standards development process are aware of the significance of the standards to their company’s success, often this awareness does not extend to the corporate decision-makers. In addition, the decision to participate in the standardization process is often made only on the basis of how time-consuming and costly this will be. The economic payback of participation in standards development is not always obvious, but the survey showed that companies actively involved in the standards process are more likely to see both short- and long-term cost benefits than those that do not participate.

2. *”Having influence in the content of a standard is an important factor in gaining competitive advantage”*. Being part of the standards development process allows the company to gain “insider knowledge” and to exert greater influence on the substance of the standards.

3. “*Standardization can lead to lower transaction costs in the economy as a whole, as well as to savings for individual business”*. The interviews with representatives of major firms as well as small- and medium-sized companies revealed that the costs of developing standards are not easily quantified. However, the businesses interviewed rated the effect on transaction costs as positive, noting that transaction cists drop considerably as a result of standards, since they make information easily accessible to all interested parties.

4. *"Standards have a positive effect on the buying power of companies"*. Standards can encourage competition within the marketplace, and can be used by businesses to exert market pressure on companies further down the value-added chain. Businesses are therefore able to use standard to broaden their potential markets. Companies also have increased confidence in the quality and reliability of suppliers who use standards.

5. *"Businesses not only reduce the economic risk of their R&D activities by participating in standardization, but can also lower their own R&D costs"*. The economic risk of research and development is lowered when a company can influence the content of standards to its advantage. In addition, the expense of R&D can be reduced when participants in standards work make their results generally available, eliminating duplication of research efforts.

6. *"Lower accident rates are partly due to standards. Participation in the standardization process increases awareness of product safety"*. The development and implementation of safety standards contributes to the reduction of accident rates, and raises awareness of safety features and practices. Representatives of consumer organizations see their involvement in the standardization process as having increased the industry's awareness of the importance of product safety. Standards are of great use to states in drawing up legislation, and are often referenced in legal cases.

7. *"An effective dissemination of innovation via standards is a precondition for economic growth"*. Innovation is an important factor in maintaining competitiveness and economic growth, but is of limited value unless this innovation is effectively disseminated. Standards are one means of disseminating new ideas and technologies, and the study showed that they have a positive influence on innovation potential and on international trade.

3.1 Standards and standardization

Standardization is essentially an act of simplification, as a result of the conscious effort of society. It calls for a reduction in the number of some things. It not only results in the reduction in the complexity but also aims at the prevention of unnecessary complexity in the future. Standardization is a social as well as an economic activity and should be promoted by the mutual cooperation of all concerned. The activity of standardization results in a recorded and agreed document based on a general agreement. (Sanders 1972).

Standards are documented consensus agreements containing safety or technical specifications or other precise criteria to be used consistently as rules, guidelines, or definitions of characteristics for materials, products, processes and services. In many cases, they provide uniformity, which allows worldwide acceptance and application of a product or material. The aim is to facilitate trade, exchange and technology transfer, remove technical barriers to trade, leading to new markets and economic growth for the industry (SFS 2002a).

SFS-EN 45020: 1998. Standardization and related activities. General vocabulary (ISO/IEC Guide 2:1996), defines a standard as a document, established by consensus and

approved by a recognized body. This document 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. They are developed by a recognized body, often in response to community or industry needs, through a process, which involves uniform agreement and public consultation with stakeholders. However, by defining common requirements, standards enable a common basis of understanding to exist between different parties. This in turn promotes both efficiency and reliability. In many scenarios it can bring major competitive edge and advantage to businesses. A standard serves as a basis for comparison, it is a single reference point against which other similar things can be checked or measured for accuracy or compliance. More precisely, standards are defined as coherent and consistent, documented, sanctioned or approved agreements. Further, according to SFS-EN 45020, standards contribute to making life simpler, and increase the reliability and effectiveness of goods and services.

Standards have been in existence for many years. At some point in time, standards were thought of as being restrictive, reduce innovation and of little importance. This perception has transformed over the years as more people come into contact with standards both at the office, in the manufacturing workshop and in everyday activities (Bensson & Maskin 2000). Today, standards are recognized as being essential to helping companies be innovative, reduce costs, improve quality and maintain competitiveness in the national and international market. As countries industries become global, standardization issues continue to grow more complex. These issues become critical to the survival and prosperity of companies marketing internationally. As more international trade agreements are implemented, domestic manufacturers face growing competition from international sources. Standardization provides a way to help reduce barriers to trade thereby increasing innovation amongst companies (Maskus et. al. 2000).

3.1.1 Nature of standards

Standards requirement has taken on an increasing importance as a determining factor of competitiveness (DIN 2000). While on one hand, it is easy to compare prices, on the other hand, it is much more complex to compare levels of quality. The existence of a unanimously recognized quality system of reference creates a very important clarification tool in this area. Another very important factor for intensifying standardization is the emergence of new techniques and technologies. All the principles and techniques, which concern different parties, require the setting up of common rules, which facilitate interoperability and connectivity between products. In the economy of a country, these techniques play a considerable and important role in addressing issues related to for example, the increasing expansion of electronic data interchange and precision in the mechanical engineering world.

Standards are interdisciplinary in nature and vary in character, subject and medium. Standards cover several disciplines dealing with technical, economic and social aspects of human activity. Basic disciplines such as language, mathematics, physics, etc. are covered by standards. Standards are developed by technical committees, which are coordinated by a

specialized body, and ensure that barriers between different areas of activity and different trades are overcome by making standards consistent and coherent. Because of the complexity and the inter-relationship between standards in different areas, it is difficult to group standards into specific classes, however for simplicity standards may fall into categories, which may be broadly grouped as mandatory standards and voluntary Standards (WSSN 2002).

Mandatory (or Regulatory) Standards are usually created by government agencies or departments and are enforced by legislation, which ensures that they are adhered to. Sometimes, standards may be written into a contract or referred to in a regulation which would make them part of that contract or regulation. Mandatory Standards, often guides or codes, which are written in a mandatory form with phrases consisting of the word, "shall" meaning the statement is mandatory. Mandatory standards are common in areas of health and safety; usually matters associated with automobile safety food, drugs, and environmental controls (WSSN 2002).

Voluntary standards are created by non-government organizations and hence do not have the backing of government legislation. They are therefore effective only if there is a very wide consensus for their acceptance by the potential users and beneficiaries of the standards. Sometimes these standards become mandatory when a governing body refers or stipulates them in legislation or regulation. Unless standards are mandatory, a company or institution is not bounded by law to conform to it. However, it is in a company's interests to adhere to relevant standards and to be involved in the standardization process. Adherence or compliance to a standard has an effect on consumer perception of a given product or service compared to another similar product which does not comply (WSSN 2002).

Standards, be they mandatory or voluntary may also be grouped into different categories. According to SFS-EN 45020, *basic standards* have wide range coverage or contain general provisions for one particular field. A basic standard may function as a standard for direct application or as a basis for other standards. Some basic or fundamental standards are concerned with terminology, metrology, conventions, signs and symbols, etc. Terminology standards exactly express what a specific word or term usually means, accompanied by definitions, explanatory notes and illustrations, thus eliminating misunderstandings and ensuring widespread understanding. An example is the controls of a tractor. *Product standards* specify the requirements to be fulfilled by a product or a group of products to establish its fitness for purpose. In this case the standard is critical in establishing conformity and interoperability (SFS-EN 45020). They apply in areas, which define size, shape, frequency, speed or other dimensions or qualities of a part of product, e.g. 540 rpm (the nominal speed of a tractor power take-off shaft in revolutions per minute).

Organization standards deal with the description of the functions of the company and with their relationships, as well as with the modeling of the activities such as quality management and assurance, maintenance, value analysis, logistics, systems management or production management etc. Under this, *process standards* specify the requirements to be ful-

filled by a process, to establish its fitness for purpose. *Service standards* on the other hand establish the requirements for a specific service (SFS-EN 45020). *Test methods standards* define testing methods so that the physical properties of performance levels of a product or material from a company can be measured (SFS, 2002a). Test method standards, sometimes supplement other provisions related to testing, such as sampling, use of statistical methods and sequences of tests.

Quality and performance (design) standards define the characteristics of a product or specify the level and the performance threshold to be reached by a service. These standards, including "Codes of Practice", determine how adequate something is for its given purpose, as well as defining the level of expected performance; e.g. child safety restraints for cars. Such standards are fundamental to most building and engineering areas and may be designed to define how things should be done optimally to guarantee certain levels of safety, conformity and reliability. Some performance standards specify the outcome of a product without actually articulating the way in which the desired outcome is to be achieved (WSSN 2002).

3.1.2 Conformity assessment and certification

Conformity assessment is an activity to determine directly or indirectly, whether the relevant requirements of a product are fulfilled. The typical examples of conformity assessment activities are sampling, testing, inspection; evaluation, verification and certification; registration, accreditation etc. The ISO/IEC Guide 2:1996 mentions certification as an asset and an advantage, both for the producer and for the purchaser, consumer or distributor. It gives an incontestable added value to the product or service bearing its mark. Certification is a procedure by which a third party gives written assurance that a product, process or service conforms to specified requirements. It is distinct from the other systems of proof of conformity such as supplier declarations, laboratory test reports or inspection body reports. Certification is based on the results of tests, inspections and audits and gives confidence to the customer on account of the systematic intervention of a competent third body. For the manufacturer or service provider, it valorizes the goods or services, opens up markets and simplifies relations. For the user, it provides assurance that the product purchased meets defined characteristics or that an organization's processes meet specified requirements. Certain product certification marks may represent an assurance of safety and quality. Certification enables one to distinguish apparently between identical products or services; it offers to everyone a possibility of appeal in the event of dissatisfaction (WSSN 2002).

Certification may cover the company as a whole or some of the company’s products. Organization certification demonstrates the conformity of, for example, an organization's quality or environmental management system to an established model such as the ISO 9000 or ISO 14000 series of management system standards. Product certification attests that a product complies with the safety, fitness for use or interchangeability characteristics defined in a standard, and in a specification supplementary to standards where they are requested by the market (WSSN 2002). Confidence in a product is enhanced when the product is

certified and is known to adhere to certain standards and principles. Similarly, companies that have their management, production process or product quality certified have an advantage and value over their non-certified counterparts. Complying with certain product standards is increasingly important and in certain cases, if standards are adopted in the laws of government, it may even be illegal to supply a product without independent certification (Temple & William 2002).

3.1.3 Participating in standardization work

The role of standards cannot be underestimated in the area of production and manufacturing. Participating in standardization work enables one to anticipate and therefore to make one's products progress simultaneously with standards development. Standards play a favorable role for innovation; thanks to knowledge transfer in the standardization process. In this way, standardization process provides a strong ground for innovating and developing products. Standardization also facilitates and accelerates the transfer of new technologies in fields, which are essential for both companies and individuals, in the form of new materials, information, systems, techniques, new systems of manufacturing, etc. Participating in standardization signifies introducing solutions adapted to the competence of one's company and equipping oneself to compete within competitive economic environments. It signifies acting on standardization, not enduring it, a factor for strategic choice for companies (DIN 2002).

Industrialists use standards as the indisputable reference, simplifying and clarifying the contractual relations between economic partners. A standard represents a level of know-how and technology, which renders the presence of industry to its preparation indispensable. Standards committees provide a forum and the platform where peer companies and competitors can come together for mutual benefit. Through standards committee activities, companies can play a leading role in the development of national and international standards that affect their industry, hence enhancing technical strength and improving their position on the market. Through participation by all competent parties concerned, standards reflect the results of joint work involving all relevant interests including producers, users, laboratories, public authorities, consumers, etc. validated by consensus. Standardization is a continuous process based on actual experience and leads to material results in practice (products – both goods and services, test methods, etc.); they establish a compromise between the state of the art and the economic constraints of the time. Standards are reviewed periodically or as dictated by circumstances to ensure their currency.

3.1.4 Standardization process

Standards are usually created in many ways. Seldom, governments create standards, and this can be at various levels, for example municipal, provincial and federal. They can be created directly by legislation, or alternatively, governments normally delegate responsibilities for defining and recommending standards to committees or working groups. The

working groups normally consist of individuals or organizations with expertise in the relevant disciplines, capable of handling the task.

Mainly, standardization takes place outside of government, which in some cases affords them an objective viewpoint. There are also international standards organizations created and empowered by multiple governments. Standards published by formal standards organizations are *de jure* standards. *De facto* standards are those implemented that are not developed, or otherwise sponsored by a formal standards body. They become *de facto* standards by virtue of their acceptance in the marketplace (WSSN 2002).

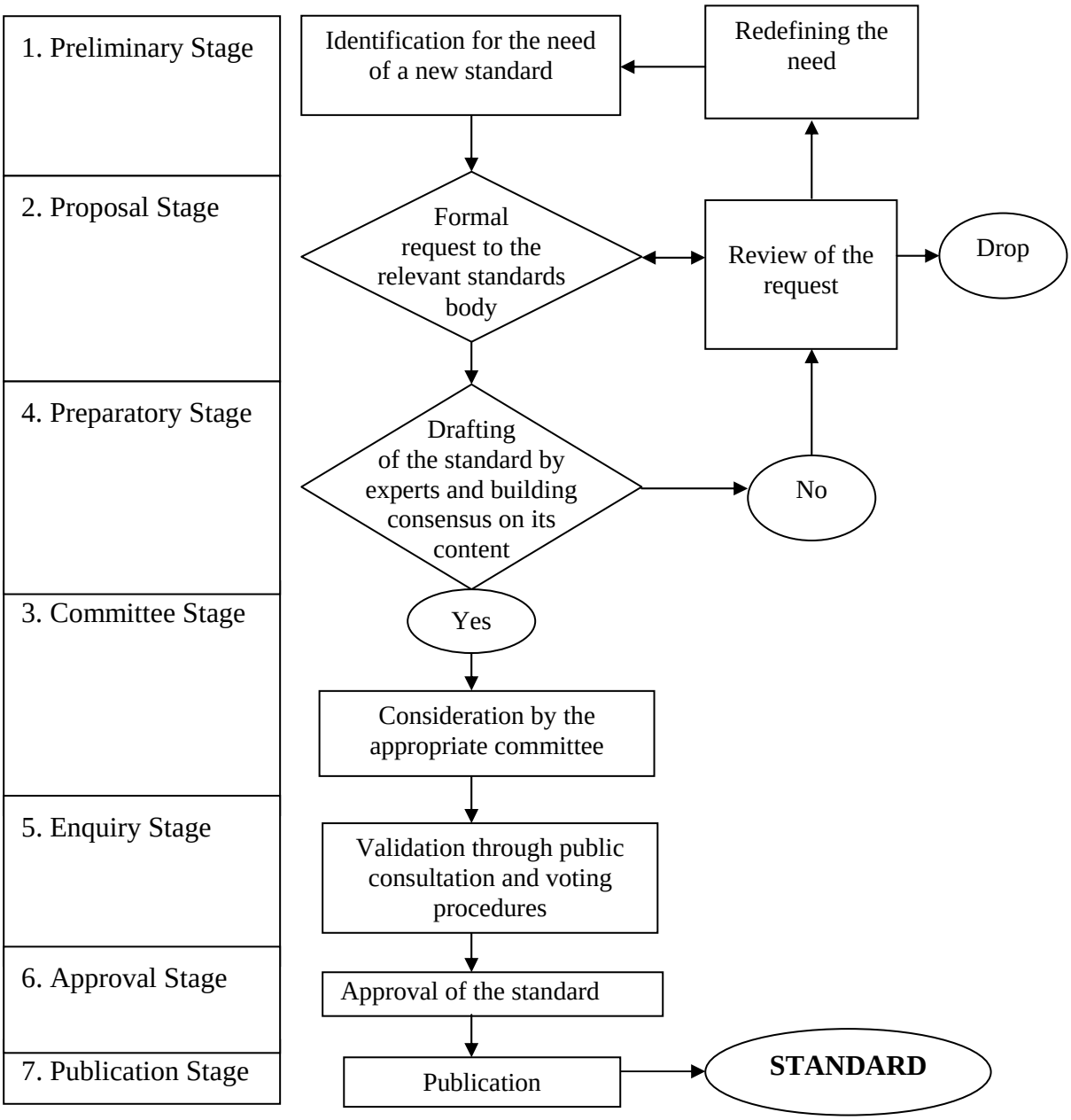

Figure 1. The standardization process (modified from ISO/IEC 2001).

Generally, in theory, there are seven stages or phases involved in the development of a standard, with consensus and transparency being of paramount and fundamental importance (figure 1). This means that there must be general agreement among stakeholders with no major dissension and the process itself must be open for scrutiny and comment to the public (ISO/IEC 2001). The standards development process may vary slightly according to the local conditions and accepted procedures under which it is made.

Referring to figure 1, an initial and formal request is issued to the standards body from the community, industry or government body stating the need for the specific standard. After issuing, a study is conducted to determine if the proposed standard will provide a technical and economic advantage without hampering trade. It will also evaluate the availability of the necessary knowledge to draw-up and develop the standard. After this initiation comes collective programming, which includes an examination on the basis of the identified needs and the various priorities of the stakeholders, followed by a decision to register the work program of the organization involved.

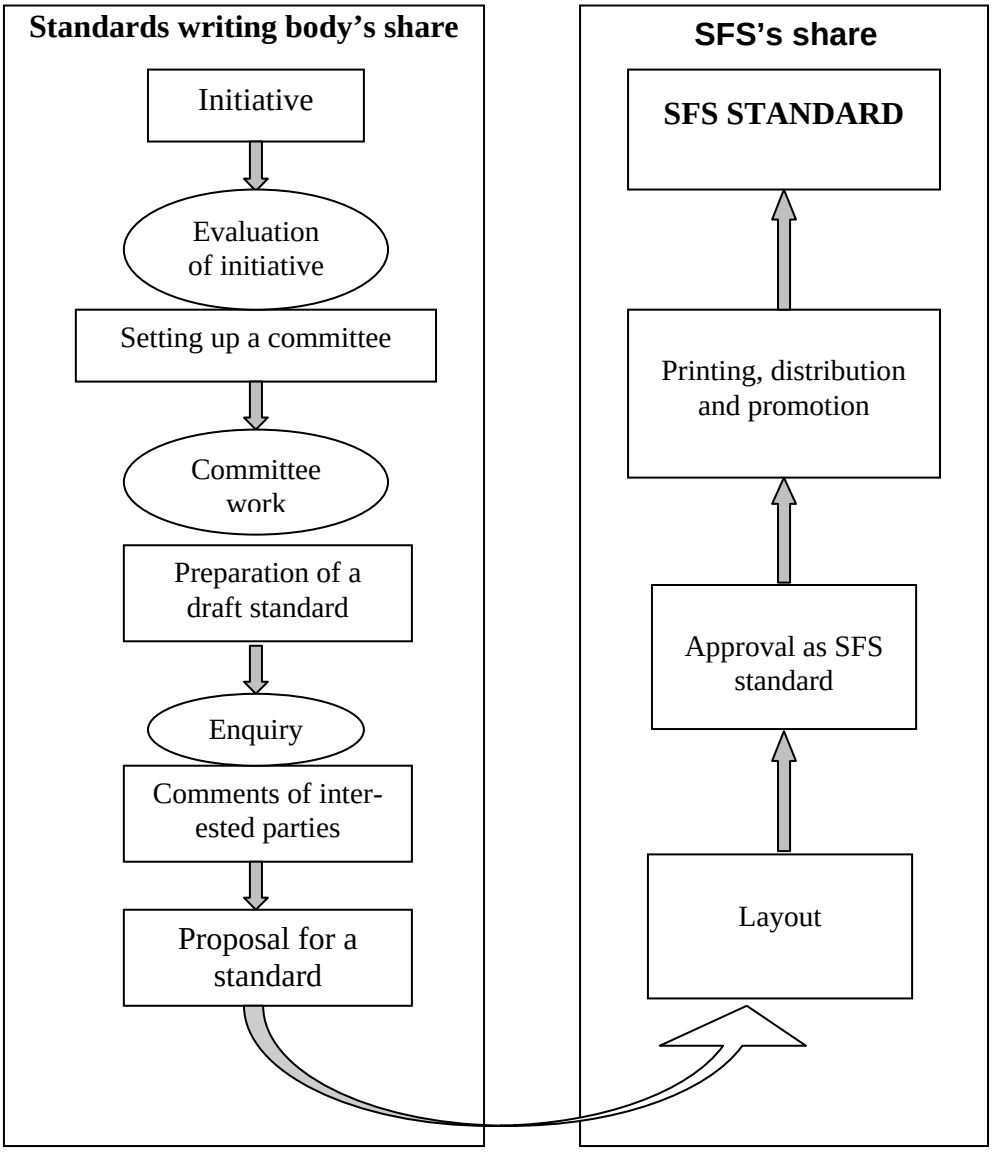

Figure 2. How SFS standards are made (SFS 2002b, SFS 2002c).

A draft standard is then drawn up by the interested parties. A standardization committee formed from all interested parties, including producers, administrators, users, consumers, and laboratories, seeks input from its members and the interests they represent. All interested parties must agree on the draft standard (consensus). The standard is validated through public enquiry to ensure wide consultation at the appropriate level, be it industry, national or international. This is done in order to make certain that the draft standard conforms to the general interest and does not give rise to any major objection. If this process goes through successfully, the text of the standard is approved for publication. This is a simplified model of the standardization process, but in most cases the steps in the process do not go smoothly and have to be looped back many times till everyone is satisfied and comes to an agreement. Following review, a standard may be confirmed without change, go back for revision, or be withdrawn (figure 1). The application of all standards forms the subject of a regular assessment of its relevance by the standardizing body, which makes it possible to detect the time when a standard must be updated to meet new needs. Figure 2 is an illustration of how standardization takes place at the national level in SFS. The actual model varies in content from country to country and national from international (figure 2).

3.2 International standardization

Standards are drawn up at international, regional and national level (figure 3). The organization and coordination of work at these three levels are ensured by common structures and cooperation agreements. When similar technologies in different countries or regions have non-harmonized standards, technical barriers to trade may arise. Some years ago, because of many stiff independent national specifications, innumerable small changes had to be made to for example agricultural machinery before it was possible to market them in another country. Export-minded industries have long sensed the need to agree on world standards to help rationalize the international trading process. International standards contribute to making life simpler, and helps to increase the reliability and effectiveness of the goods and services we use.

The International Organization for Standardization, ISO is a worldwide federation of national standards bodies from more than 148 countries (January 2004), one from each country. International standardization began in the electrotechnical field: the International Electrotechnical Commission, IEC was created in 1906. Pioneering work in other fields was carried out by the International Federation of the National Standardizing Associations ISA, which was set up in 1926. The emphasis within ISA was laid heavily on mechanical engineering. ISA's activities ceased in 1942, owing to the Second World War. Following a meeting in London in 1946, delegates from 25 countries decided to create a new international organization "the object of which would be to facilitate the international coordination and unification of industrial standards". The new organization, ISO, began to function officially on 23 February 1947. The first ISO standard *ISO 1:1975: Standard reference temperature for industrial length measurement* was published in 1951 (ISO 2002). To date (January 2004), ISO has published over 14 000 International Standards. ISO counts over

2981 technical work bodies made up of technical committees, subcommittees, working groups and ad hoc groups.

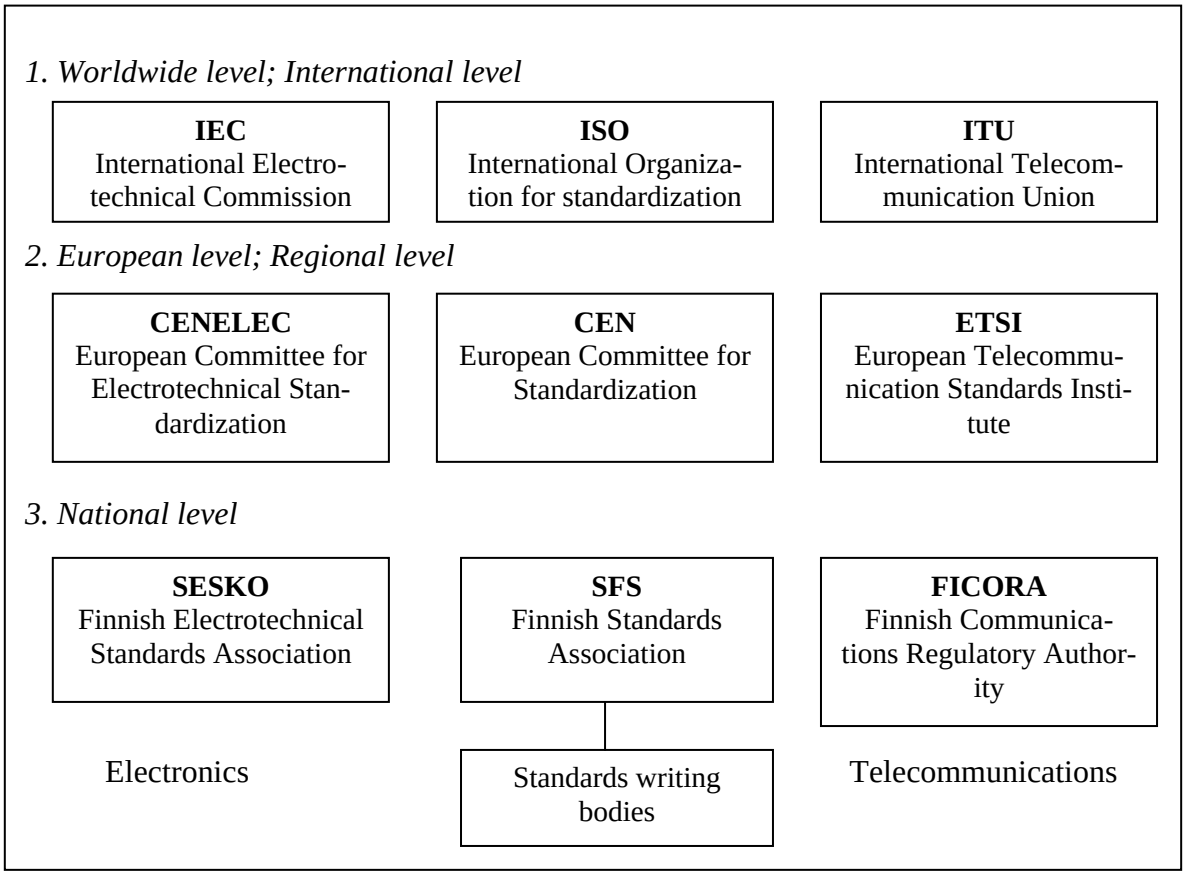

Figure 3. Levels of standardization (SFS 2003).

Currently, ISO aims at reducing the time involved in developing international standards. The July 2003 issue of the TMB communiqué for ISO for example has listed time frames for development of international standards. The "accelerated" track aims at producing standards within two years, the "default" track; producing standards in three years and the last track for complex standards projects, a foreseen time frame of four years. In addition to the above, from 1 September 2003, there are new time periods after which standardization projects will be automatically cancelled. Projects, which have not been moved for the last two years, will be automatically cancelled (instead of 3 years). Also projects, which have not reached publication stage after five years will be automatically cancelled (instead of 7 years). There are also attempts made at reducing standardization at the regional level in CEN.

3.3 Regional standardization

At regional level, standardization work in Europe is conducted by the European Committee for Standardization CEN. Founded in 1961, CEN draws up standards in the region and the 2002-2003 annual report states CEN to have a current membership of 22 national standards organizations, 12 affiliates, a number of associates, counselors and corresponding members. At the beginning of the year 2004 six new members Estonia, Latvia, Lithuania, Po-

land, Slovenia and Cyprus joined the organization. CEN has witnessed strong development amongst its member states made up of European Union members, the European Free Trade Association EFTA members, and some Eastern and Central European countries. The aim of CEN is to eliminate internal European trade barriers resulting from differing national technical standards. It also has an aim to stimulate industry and trade and therefore promote safety, economy, and efficiency through the creation, harmonization, and promotion of European standards.

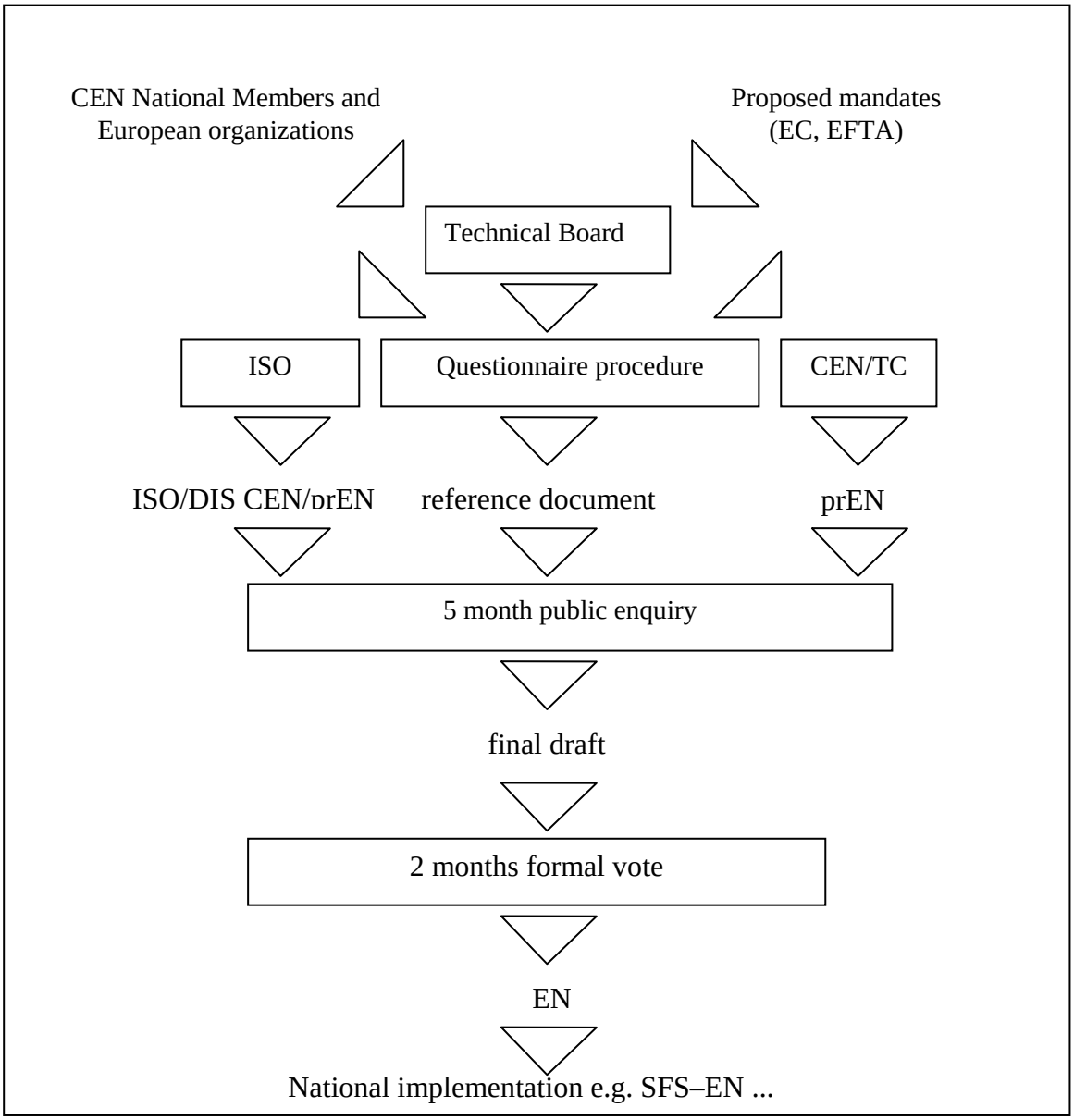

Figure 4. How European standards are developed (CEN 1995)

The CEN Technical Board (CEN/TB) is in charge of the coordination, planning and programming of the work which is conducted within the work bodies; technical committees, working groups. The secretariats of the technical committees are decentralized in the different EU member states. CEN is composed of over 270 technical committees, has published some 9018 European standards and approved documents at the end of 2003. Over 6000 documents are under study. The European Committee for Electrotechnical Standardi-

zation (CENELEC) founded in 1959, fulfils within the electrotechnical sector the respective functions as CEN. The European Telecommunications Standards Institute ETSI is youngest of the three European standards preparing organizations responsible for creating telecommunication standards within the region (CEN 1995, CEN/CENELEC, ANSI 1996).

The time involved in developing European standards has been reduced. Currently, the time for CEN enquiry has been reduced to 5 month instead of the former 6 months (figure 4). Furthermore, the total project time involved in preparing EN standards has now been shortened to 36 months. There are also other timeframes such as the "UAP"- a timeframe under optimum conditions; total project time 12 months, "Target"- a timeframe foreseen to become the favorable solution for general work and also the average project time goal of 36 months, and "Tolerance"- a timeframe for complicated or delayed special of cases maximum project period of 54 months (CEN 2002b).

The drive for international standards to support international trade is what led to the Technical Barriers to Trade Agreement mentioned earlier and agreed as part of the GATT Uruguay round. The directives based on the "New Approach" made under Article 95 of the EC treaty specify health and safety requirements and sometimes other essential requirements (ER) in broad terms. Thus, although the application of the standards remains voluntary, European policy on technical barriers is inextricably bound up with standardization. The significance of European standardization has also increased greatly after 1985 when the EEC made a decision on the new approach towards technical harmonization. According to it, an attempt is made to restrict the essential demands, which are placed on the products in corporate legislation. Thus to facilitate producing and marketing demands of products, standards are drawn up in accordance with in European standardization organizations. However, they are not compulsory to the manufacturers. Instead the authorities cannot set supplementary demands to the standard that is related to the directives products.

Hebner (1999) points out that this agreement gives preference to international standards as a basis for the individual countries' standards and encourages developers of national and regional standards to defer to international standards. The underlying principle of the European Community's New Approach is to make use of standards so that legislation can be more goal-based, thus contributing to better regulation policy. In effect, responsibility for implementing regulation is shared with industry, since industry through the standards bodies is entrusted with drawing up the standards, which give presumption of conformity. Furthermore, there is no need to amend legislation in the light of technical progress, provided that the standard is maintained. (Emond 2001)

Another organization that has played an important role in international trade and issues related to international standards in the World Trade Organization WTO, the predecessor of General Agreement on Tariffs and Trade GATT. The last negotiations of the GATT Uruguay Round gave birth to the WTO, which was established on 1 January 1995. As of 5 February 2003, there were 145 members and some other observers. The Agreement on Technical Barriers to Trade WTO TBT is one of the 29 individual legal texts of the WTO

agreement that obliges members to ensure that technical regulations, voluntary standards and conformity assessment procedures do not create unnecessary obstacles to trade. The Annex 3 of the TBT agreement is the “Code of good practice for the preparation, adoption and application of standards” related to standards. In accepting the TBT Agreement, WTO Members agree to ensure that their central government standardizing bodies accept and comply with this Code of Good Practice and agree also to take reasonable measures to ensure that the local government as well as non-governmental and regional standardizing bodies do the same. The Code is therefore open to acceptance by all such bodies. The TBT Agreement recognizes the important contribution that international standards and conformity assessment systems make to improve the efficiency of production and facilitate international trade. Therefore, where international standards exist or their completion is imminent, the Code of Good Practice says that standardizing bodies should use them, or the relevant parts of them, as a basis for standards they develop. The WTO also aims at the harmonization of standards on as wide a basis as possible, encouraging all standardizing bodies to play as full a part as resources allow in the preparation of international standards by the relevant international bodies (WTO 2003).

3.4 National standardization

Different countries have their own national standardization systems. Usually, the sole national standardization body participates in the regional or international standardization work with the help of standards writing bodies of different fields of interest. At national level, standardization work is conducted by standards committees, which can obtain assistance from groups of experts. These committees or working groups are made up of representatives of the industrial circles, research institutes, public authorities and consumer or professional bodies. The structure of standardization varies from one country to the other. A typical national standardization working process is shown in figure 2.

Some national standardization systems have their standardization grouped according to specific industries. These industries or federations may be totally independent, functioning as a standards writing bodies, or consist of specialist individuals involved in national standardization. Sector-wise (agricultural and forestry machinery sector) standardization is a condition existing within a particular industrial sector when the large majority of products or services conform to the same standards. It results from consensus agreements reached between all economic players in that industrial sector - suppliers, users, and often governments. They agree for example on specifications and criteria to be applied consistently in the choice and classification of materials, the manufacture of products, and the provision of services. The aim of industry-wise standardization is to facilitate trade, exchange and technology transfer through enhanced product quality and reliability at a reasonable price, improved health, safety and environmental protection, and reduction of waste. Others include enhancement of compatibility and interoperability of goods and services, simplification for improved usability, reduction in the number of models, and thus reduction in costs and increased distribution efficiency, and ease of maintenance of products (CEN 2002).

3.5 Standardization in Finland

3.5.1 Initiation of standardization in Finland

At the instigation of the Finnish Engineering Machinery Manufacturers Association, an initiation meeting was held in 1922 to start standardization in Finland. Present at the meeting were representatitives from the Ministry of Defence *(Puolustusministeriö)*, the Finnish Railways *(Valtionrautatiet)*, the National Board of Navigation *(Merenkulkuhallitus)*, the Swedish speaking Technical Association in Finland *(Tekniska Föreningen i Finland)*, the Association of Technicians *(Suomalaisten Teknikkojenyhdistys)* and the Finnish Engineering Machinery Manufacturers Association *(Suomen Konepajainsinööriyhdistys)*. After a briefing about standardization work in foreign countries, the parties present at the meeting acknowledged the need to centralize standardization in Finland. In 1924 a standardization committee, the predecessor of the present Finnish Standards Association was established in Finland. Some of the key tasks of the standards association board were to:

- raise interest in standardization and to promote it in the field of technical and industrial production sectors,
- act as the central standards organization in Finland and cooperate with other countries' standards organizations,
- confirm as Finnish standards, the proposals that have been drawn up in the right order after thorough assessment and
- promote the use of standards in institutions and municipalities in the country, as well as in industries, trade and agriculture.

There were also conditions that had to be fulfilled in order to confirm draft standards as Finnish standards. These included:

- the proposed standards have to bring general benefits and produce economic interests and benefits for all,
- the properties of standards proposals have to be able to stay unchanged long enough taking into consideration event changes and development trends,
- the proposal must consider scientific, technical and economic demands; thereby have an advantageous purpose in these aspects.

In addition, the standards proposal has to lead to simplifying and solving problems related to standards without displacing the normal needs of the product being standardized. It was also proposed that the standard proposal for the products of Finnish industries should be fitted, if possible to the conditions of international trading countries for the benefit of industries and technical related fields.

The economic depression experienced in Finland at the end of 1920 also affected standardization work, so that standardization work became active again after the latter half of 1930's. The activities of the standards committee were also revived when support was provided by the government and the general economy of the nation improved. As a consequence of the Second World War, the Work Efficiency Union of Industries (*Teollisuuden*

Työteholiitto) to which the Finnish Standardization Board *(Suomen Standardisoimislautakunta)* and the Rationalization Board of Industry of Finland *(Teollisuuden Rationalisoimislautakunta)* belonged, was established in 1942. Negotiations and active interests in 1942 about reorganising standardization work resulted in the establishment of the Finnish Standards Association *(Suomen Standardisoimisliitto)* at the end of 1946. The essential difference between the earlier and the new organization was the division of labor between a central organ, and the professional associations; dealing with different areas of speciality (Kaartama 1984).

In 1947 when the Finnish Standards Association had gained ground, an attempt was also made to specifically clarify what standardization was. The 1947 annual report stated that, "standardization is a fight against the biggest problem of welfare spending, this spending can be found in the form of time, money, raw materials, work and labor. Especially under national conditions, standardization is a poor man's weapon for achieving better living standards. It is a road to better welfare of the people". Standardization work continued for the whole of the 1950's and a structure of operations got established. On the 13th of December 1951, the government strengthened the regulations concerning the use of the mark of the standards association. However, using the Finnish Standards Association's mark on products begun only at the end of the year 1960. The association also started marketing the use of their mark purposefully for industries during the first half of 1970's. In the 1960's more attention than before was paid to the operation of the office of the association. Publication and printing methods were renewed, cash on delivery was introduced into the billing of standards and the total area of operation of the association also enlarged. During that same transformation time, the EFTA countries agreed on technical regulations and compulsory standards notification process and this notification tasks was assigned to SFS in Finland (Kaartama 1984).

The largest marketing campaign on standardization was connected with the introduction of the International System of Units (SI) during the 1960's. The association began to regularly publish a news magazine (SFS-tiedotus) in November 1969, which gave more information to the public. The paper gained affirmative criticisms and proved to be an extremely important means of communication about standards work progress.

The decade of 1970 marked a turning point in the operation of the association. The most important change in the administration of the union was the separating of the tasks of government and that of the standardization board. The board, which had representatives from different fields, could then concentrate on establishing SFS standards and giving instructions concerning the drawing up of standards. In 1975, nine ministries became members of the association whereas the formally separate civil service and departments *(Valtion virastot ja laitokset)* were removed from the membership of the association. In 1980, the Ministry of Trade and Industry *(Kauppa- ja teollisuusministeriö)* set up a GATT information center concerning the technical barriers of trade in SFS. The establishment of such a center was a requirement for all GATT members. Later in 1982, the Association of Informative Labeling of Products *(Tavaraselosteliitto)* was also closed down and its operations were

moved to SFS. The Standards Association awarded the first quality system certificate to Kemira's personal protection equipment in January 1990. Certification enlarged remarkably after that and on the 31st of October 2002, certification work was moved Inspecta Oy.

In 1989 a regulation concerning the language of standards made it possible to refer to foreign standards without necessarily translating them. Due to this, standards which do not have much use in Finland, even if they were connected for example to the legislation of the EU do not need to be translated into Finnish. New rules about standardization were laid in 1993 such that the managing director of SFS confirms all the SFS standards, which are in accordance with European or international standards. The Standards Board confirms all other SFS standards.

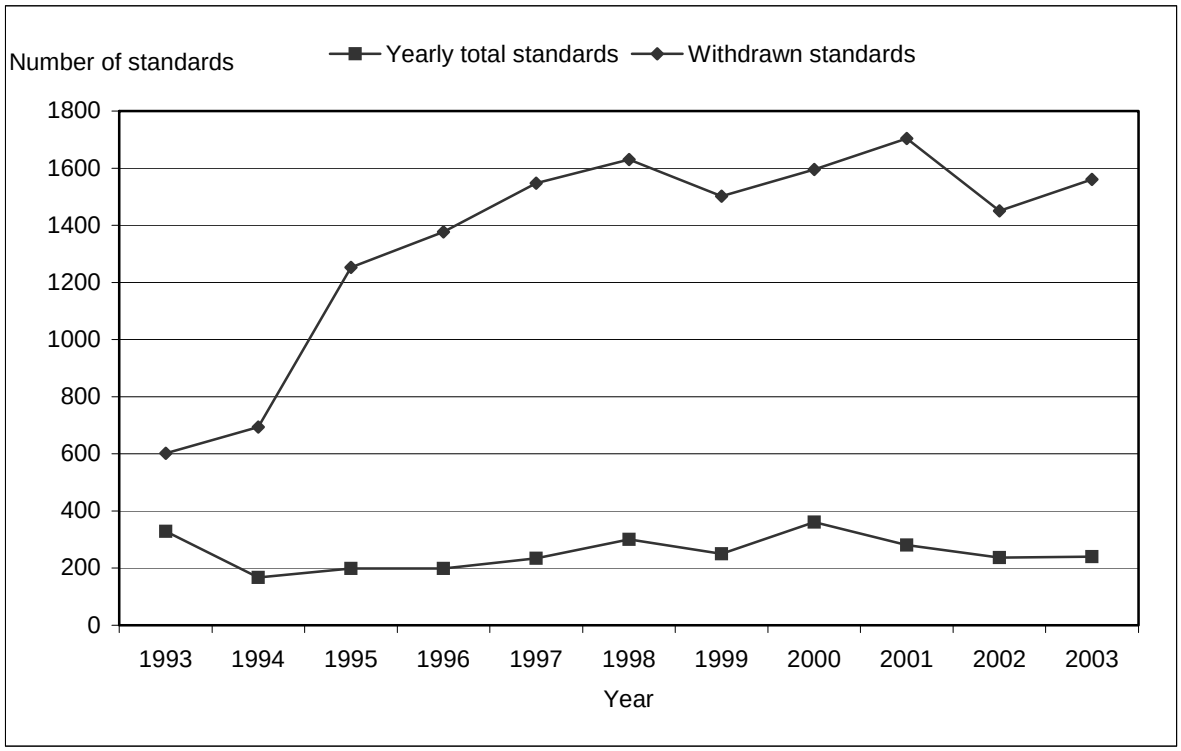

Figure 5. Development of annually confirmed SFS standards (SFS 2003)

Presently, the Finnish Standards Association SFS serves as the central standardization organization in Finland. SFS is an independent non-profit making organization. SFS works in cooperation with trade federations and industries, research institutes, labor organizations, consumer organizations as well as governmental and local authorities. Members of SFS include professional, commercial and industrial organizations, and the state of Finland represented by the ministries. At the end of year 2003, the number of SFS standards was over 17 000 (figure 5 & 6). SFS standards are voluntary documents and are generally drawn up by standards-writing bodies of SFS. In practice the representatives of the various industries, organizations and individuals cooperate with SFS or its standards writing bodies and also contact the standards association when they want to make a suggestion for a standard.

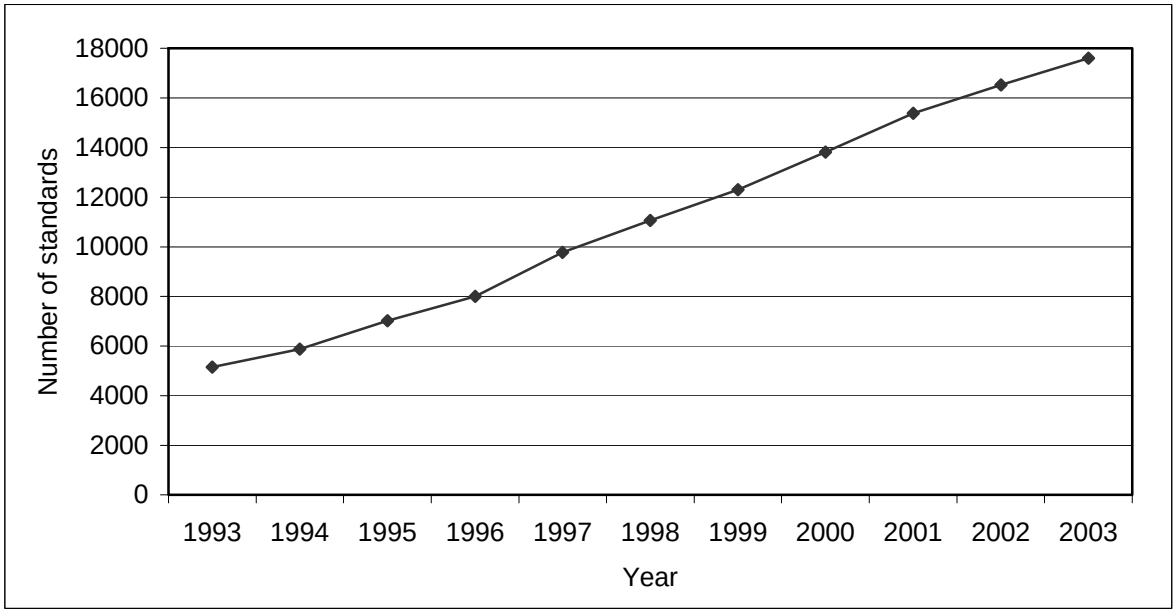

Figure 6. Number of valid standards (SFS 2003).

The two biggest standards writing bodies in SFS are the Technology Industries of Finland *(Teknologiateollisuus)* and the Finnish Electrotechnical Standards Association *(Suomen Sähköteknillinen Standardisoimisyhdistys SESKO)*. Standard are prepared by reference or working groups who draw up the standard proposal. Representatives of manufacturers, users, authorities and research institutions are present in these committees. National committees could also be assigned European or worldwide standardization tasks. In Finland, the practical work is done in the working groups. When a standard proposal is ready, it is sent for commenting and approval by all the parties whom the standards concern. When the received answers have been processed and appropriate changes done to the proposal, final voting is taken to decide its acceptance (figure 2). All European standards are confirmed in Finland as SFS standards, and existing national standards conflicting with them are withdrawn. The management standards compilation work is taken care of by cooperation with the 15 standards writing bodies as shown in figure 7.

Today most SFS-standards are prepared by implementing international ISO or European CEN standards, and only a few a purely national standards are published.

Private organizations

- Chemical Industry Federation of Finland *(Kemianteollisuus ry)*
- Confederation of Finnish construction Industries *(Rakennusteollisuus RT ry)*
- The Finnish Pulp and Paper Research Institute *(Oy Keskuslaboratorio)*
- Finnish Forest Industries Federation *(Metsäteollisuus ry)*
- Standards Association of Textile and Clothing Industry *(Standardisoimisyhdistys TEVASTA ry)*
- The Finnish Plastics Industries Federation *(Muoviteollisuus ry)*
- Finnish Electrotechnical Standards Association *(SESKO ry)*
- Finnish Information Technology Development Centre *(Tietoyhteiskunnan kehittämiskeskus ry, TIEKE)*
- General Industry Federation (*Yleinen Teollisuusliitto, YTL)*
- Finnish Oil and Gas Federation *(Öljy- ja Kaasualan Keskusliitto)*
- Technology Industries of Finland *(Teknologiateollisuus ry)*

Governmental bodies

- Telecommunications Administration Centre *(Viestintävirasto)*
- Agricultural Engineering Research *(Maatalousteknologian tutkimus (Vakola))*
- Finnish Environment Institute *(Suomen ympäristökeskus, SYKE)*
- Finnish National Road Administration *(Tiehallinto)*

Figure 7. Standards writing bodies of SFS (SFS 2003).

3.5.2 Cooperation of Finland in international standardization

Electrical engineering in Finland had international standardizing cooperation already in the first decade of the 20th century. In other fields, the corresponding operation began only at the end of the 1920's and Finland participated mainly through Sweden. In 1937 Finland also took part in the technical work to standardize automobile rims and tyres. During the years 1938-40 Finland was part of the International Standards Association's (ISA) council.

To promote international cooperation the standardization board of Finland took a positive stand in establishing an international standardizing board already in 1924 at the initial stages of its establishment. In 1939, the board actively participated in international cooperation. The board had the task of arranging the international conference of standardization. It took place between the 26th of June and the 7th of July 1939 in Helsinki.

International standardization activity subsided during the world war years. After the war, the United Nations made the initiative to establish a new organization because they realized that, after all that has happened during the war, the old organization could not be brought back to life again. This resulted in the founding of the present International Stan-

dardization Organization ISO in London in October 1946. When business activity and rebuilding after the war recovered, the demand for the foreign standards also increased in Finland. An agreement was made with the Bank of Finland on the supply of the necessary currency to secure the supply of foreign standards. In 1947 there were already connections to 28 different countries from which the association conveyed standards to Finnish industries. During the years 1959-1961, the chairman of the Finnish association professor Edward Wegelius was also the chairman of the International Standardization Organization ISO. Finland got its first international secretariat task within ISO in 1959, *ISO/TC 6/SC 5; Quality definitions and test methods for paper and pulp*. Finland still has this responsibility and is taken care of by Keskuslaboratorio Oy, a research institution of the wood processing industry. The general assembly of ISO was held in Helsinki in June 1961. Finland participates in all the three international standardization organizations. The Finnish Standards Association SFS is a member of ISO whist the Finnish Electrotechnical Standards Association (SESKO) takes part in the International Electrotechnical Commission (IEC) and the Finnish Communications Regulatory Authority (FICORA) take part in the International Telecommunication Union's (ITU) work (figure 3).

3.5.3 Cooperation of Finland in European standardization

Finland participated in the European Standardization Organization's (CEN) operations since the 22nd of March 1961. The significance of European standardization has increased greatly after 1985 when the EEC made a decision on the new approach in technical harmonization.

Furthermore, the EU uses standards also as a support for legislation for example in machinery safety, in public procurements and building. Currently, Finnish Standards Association SFS participates very actively in CEN (including Finnish Electrotechnical Standards Association (SESKO) and the Finnish Communications Regulatory Authority (FICORA)). All standards drawn up by CEN must be confirmed as national standard in Finland and conflicting standards must be withdrawn.

3.6 Agricultural and forestry machinery standardization in Finland

3.6.1 Initiation of agricultural and forestry machinery standardization in Finland and in Vakola

Two years after the standardization initiation meeting in 1922, the Standardization Committee, the predecessor of the present Finnish Standards Association SFS was established. Already during the following year, standards concerning several units and screw threads were published. The screw threads were in accordance with the SI-forin endorsed in Ziffich during the year 1898. An Agricultural Machinery Committee was established in 1929 following an initiation by The Agricultural Producers Confederation, MTK. The first Finnish national SFS standard concerning agricultural machinery *SFS N.I.1: Peripheral*

speeds and diameters of belt pulleys for agricultural engines and machines was published on the 28th of March 1930. N.I.1 remained the only agricultural machinery standard for the year 1930, but in 1931 the following six standards were published:

- N.I.9; Spark plug for agricultural engines
- N.I.13; Spring-tined harrow, point and screw
- N.I.22; Cambridge press rollers, toothed disc
- N.I.23; Cambridge press roller, smooth disc
- N.I.27; Press roller; smooth disc
- N.I.33; Mowers, knife sections

References to international standardization work concerning tractors were made in SFS-catalogue of the year 1934. However the first tractor-related standards were not published until 1960's. The three-point-hitch system developed by Harry Ferguson was used in Finland already during the 1950's and was standardized in England in 1951, in 1957 and 1958 in Sweden and Germany respectively. The three-point-hitch was also the topic of the first tractor related SFS standard; SFS N.I.2 *Tractors. Three-point-linkage. Connection dimensions of machines and implements.* published in 1961. Three-point hitch, two-point hitch, four-point-hitch, mechanical, pneumatic and electric lifts were found on tractors tested in Vakola (the Agricultural Engineering Research Center of Finland) during the 1950's. Most often the three-point hitches were not of any specific standard, so the publication of the standard was very important. The tractor standards published in 1961-62 were mostly based on British, Swedish and German standards, but no international sources were mentioned (Olkinuora).

An agreement between the Finnish Standards Association and the Research Institute on Agricultural Machinery Vakola was signed in May 1973. Vakola then became a SFS standards writing body in the area of agricultural and forestry machinery. Later, the secretariatship on the ISO forestry machinery subcommittee ISO/TC 23/SC 15 was included in the responsibilities of Vakola.

In 1976 two national standardizing committees were established to support standardization work in Vakola, MAKOSTA for agricultural machines and MEKOSTA for forest machines. Manufacturers, users of machines, marketing, research, advisory services, education and occupational safety authority were represented in both committees. MAKOSTA and MEKOSTA prepared Finnish comments on international, European and national standardization proposals. Since then the stock of standards in the field of agriculture and forestry has been updated. The old outdated standards were withdrawn and replaced using mostly international standards as basis. Close cooperation with Sweden and earlier also Denmark produced good results in ISO where every member country has one vote.

By the beginning of the 1970's VAKOLA (with the present name Agricultural Engineering Research Finland, MTT Vakola) had already been taking part in the tractor and vocabulary standards preparation groups organized by the Federation of Finnish Metal and Engineering Industries (presently known as the Technology Industries of Finland, *Teknologiateol-*

lisuus TES*)*, standards department. The law, which regulates the operations of Vakola, defined the promotion of the standardization as one of the tasks of the institution. Before the signing of the said agreement Vakola had already together with the industry prepared standard SFS 2781 Flexible S-tine: Dimensions and quality requirements.

In December 1973 Finland participated in ISO/TC 23 *Tractors and machinery for agriculture* meetings for the first time. The Finnish delegate, VAKOLA's director professor Reinikainen, proposed to start standardization of forestry machinery. France supported the idea and the meeting decided to circulate an inquiry to the member countries about establishing of a special forestry machinery committee and asking for volunteers for the secretariat work. Finland volunteered to be the secretary, and was assigned the task. Ten countries supported the proposal and the forestry machinery subcommittee ISO/TC 23/SC 15 was established in July 1974. The third TC 23 meeting in March 1975 ordered SC 15 to begin its work by arranging its first meeting. The meeting was held in Septernber/October of the same year.

Today the responsibilities of MTT Vakola related to standards include *ISO/TC 23 'Tractors and machinery for agriculture'* and the respective European work in *CEN/TC 144* also *'Tractors and machinery for agriculture and forestry'* as well as *CEN/TC 334 Irrigation techniques*. In addition to the ISO/TC 23/SC 15 also the secretariat work of *CEN/TC 144/WG 8 'Forestry machinery'* has been added to the responsibilities. In Summer 2004 ISO/TC 23/SC 15 has had 22 meetings and CEN/TC 144/WG 8, six meetings. Figure 8 shows the number agricultural and forestry machinery standards publuished by SFS.

The responsibilities and duties between the signatories of the agreement of the standards writing body have been clarified including certain financial aspects. Vakola gets e.g. its share on the sales of its standards and also support for running the international secretariat work. The number of national committees has increased, new groups are established and others ceased as new work items come and go. Still the dividing line between SFS and the standards writing bodies is the publication of standards. The standards writing bodies prepare SFS-standards for publication and SFS takes care of the rest including sale of standards. The standards writing body also comments and takes care of the voting of International and European proposals in their field.

See http://www.mtt.fi/tutkimus/teknologia/standardisointi3.html

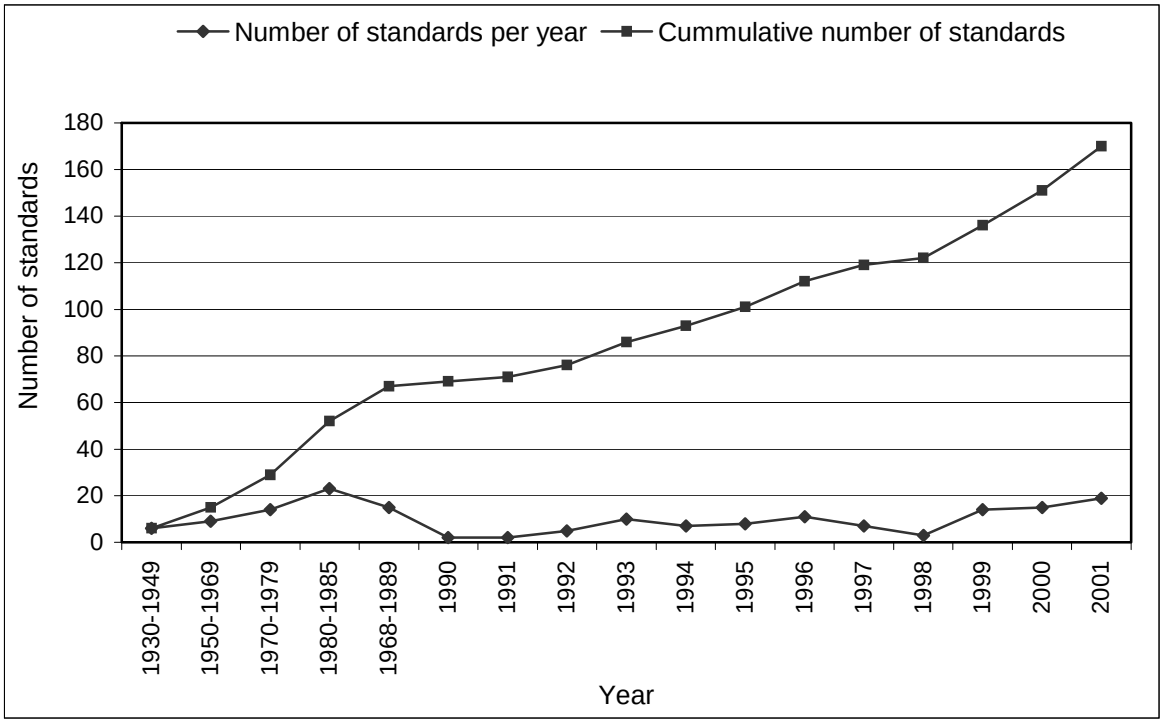

Figure 8. Development of annually confirmed agricultural and forestry machinery standards (SFS). All standards are from SFS according to International Classification for Standards (ICS) 65.060

3.6.2 International work in agricultural and forestry machinery standardization

Power take-off (PTO) drive shafts and three-point linkages were the first two work items on the International standardization related to a tractor. Work of the PTO shaft begun in 1952 and it reached its final voting in 1961. The voting stage was long and painful because the recommendation ISO/R 500 was published five years later and still it had four disapproving votes; Canada, Poland, USA and Soviet Union. In all 20 countries had accepted the proposal, but Finland was not mentioned among the countries which have voted. ISO/R 500 mentioned only one shaft type, 6 spline, 35 mm and rotational speed 540 r/min. Because the handling of the subject took so long, several national standards were already published before the ISO recommendation. In Finland SFS N.1.7 on tractor power take-off shaft (540 r/min) was published in 1962. The 6-spline power take-off shaft had been standardized in the USA as early as in 1927 and 1940 in Germany.

The three-point linkage system came to the programme of ISO in 1954. The final proposal was completed eight years later and the recommendation ISO/R 730 was published in 1964. A British standard BS 1841, based on the Ferguson lift was published as early as in 1951. Also the three-point linkage was already published in Finland as a national standard; SFS N.1.2, three years before the publication of the ISO recommendation.

When ISO begun, its work it was organized into technical committees. The tractor items were first dealt with by the *tractor group* of *the road vehicles technical committee* of ISO/TC 22 T, and the agriculture machines were in the *technical committee* ISO/TC 23. The agricultural machinery committee of ISO, ISO/TC 23, was reorganized at the begin-

ning of the year 1971. The earlier tractor group, ISO/TC 22 T in the vehicle committee was wound up and it became a subcommittee of TC 23. The country where the secretariat of TC 23 was situated changed from Portugal to France. At its first meeting the new TC 23 founded 12 subcommittees related to different machine groups (Olkinuora 1987). Presently, MTT/Agricultural Engineering Research takes active part in international standardization work in the field of agricultural and forestry machines.

3.7 Agricultural and forestry machinery manufacturing and market in Finland

3.7.1 Agricultural and forestry machinery manufacturing industry

The agricultural and forestry machinery manufacturers sector is made up of a large number of small and medium-sized companies. Towards the end of the 1990's there were more than 700 places of business (working places) in the agricultural and forestry machinery manufacturing sector according to Statistic Finland. Nearly 90 % of the manufacturing places of business have less than five working personnel (table 1). According to the statistics, there were 12 companies, which employ over 100 persons of which tractor manufacturer; Valtra Oy is by far the biggest. The total number of Valtra Oy's workers is more than half of the 12 companies put together and has a turnover of about 2/3 of these companies (Manni & Riipinen, 2002).

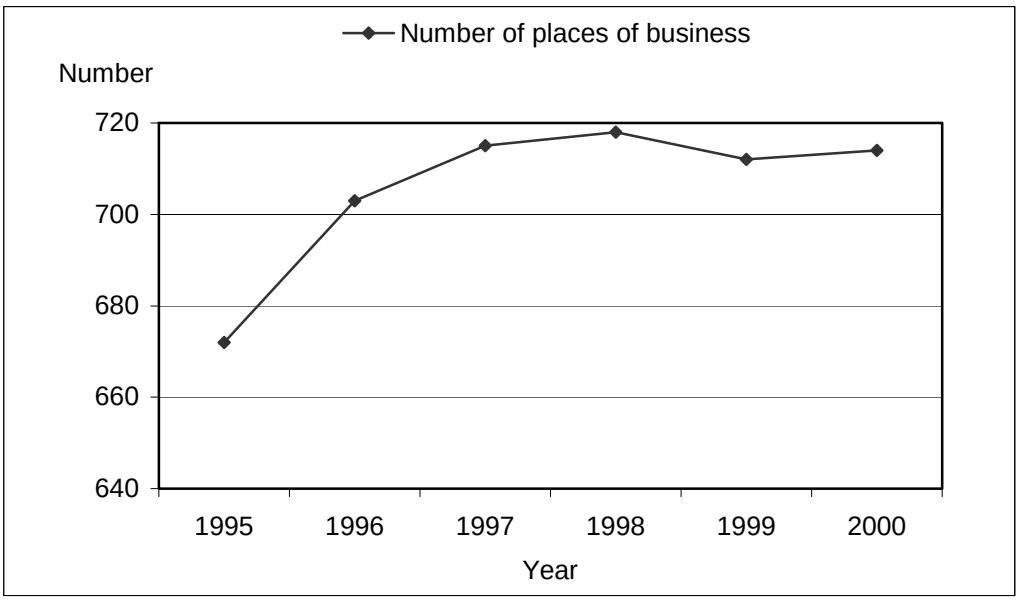

Figure 9. Number of places of business in the agricultural and forestry machinery manufacturing sector (1995-2001)

Table 1. Places of business for agricultural and forestry machinery manufacture in 1998 (source: Manni & Riipinen, 2002).

Number of workers at the end of 1998	Places of business	Total number of workers altogether	Turnover in mil Euros
1-4	633	522	60
5-29	58	539	60
30-49	8	273	33
50-99	6	418	40
100-	12	2 294	482
Total	717	4 046	675

The number of personnel has increased from 2500 during the economical slump in the 1990's to about 4000 at the end of the decade. The turnover per person has grown noticeably. The number of places of business has remained the same at the latter half of 1990's (figure 9). The agricultural machinery market has been and still is mainly dominated by Finnish products (45-55% are Finnish made machinery). Finland joining the European Union in 1995, along with supports to the industry and the introduction of the Value Added Tax (VAT) system brought a reviving trend to the market.

3.7.2 Agricultural and forestry farms in Finland

It is estimated that the number of farms in Finland will decrease from the present figure of about 75 000 to 40 000 within the next ten years. Practically, the number of farms will decrease and the individual farm sizes will increase, but the production level will remain the same (figure 10). In this case the machinery sizes will also increase though the sales number is predicted to drop (Manni & Riipinen, 2002).

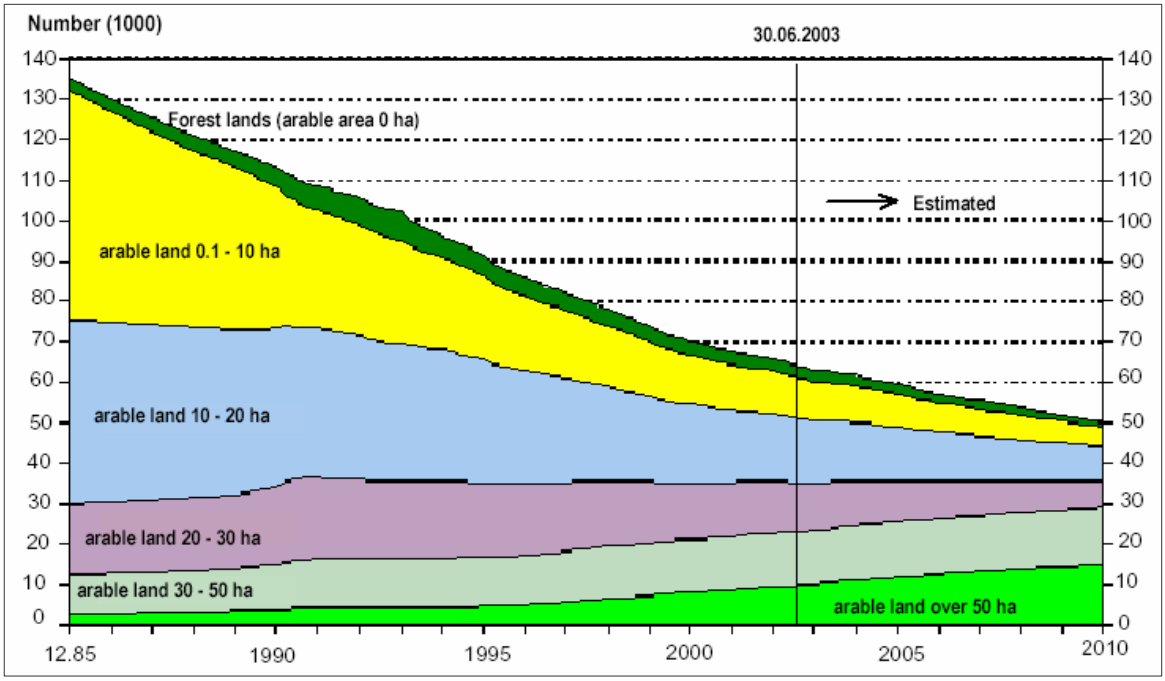

Figure 10. Number of farms according to farm sizes from 1985 - 2010 (reference with permission from MELA)

3.7.3 Agricultural and forestry machinery sales in Finland

The export of agricultural and forestry machines from Finland has been growing since 1994. Tractor export from Finland has also been growing steadily in the 1990's whilst import has remained quite constant. When exports figures are compared in the Nordic countries, Finland's performance is noteworthy. Figures 11 to 13 show the development trends in the sales, import and export in the agricultural machinery manufacturing industry (Manni & Riipinen 2002).

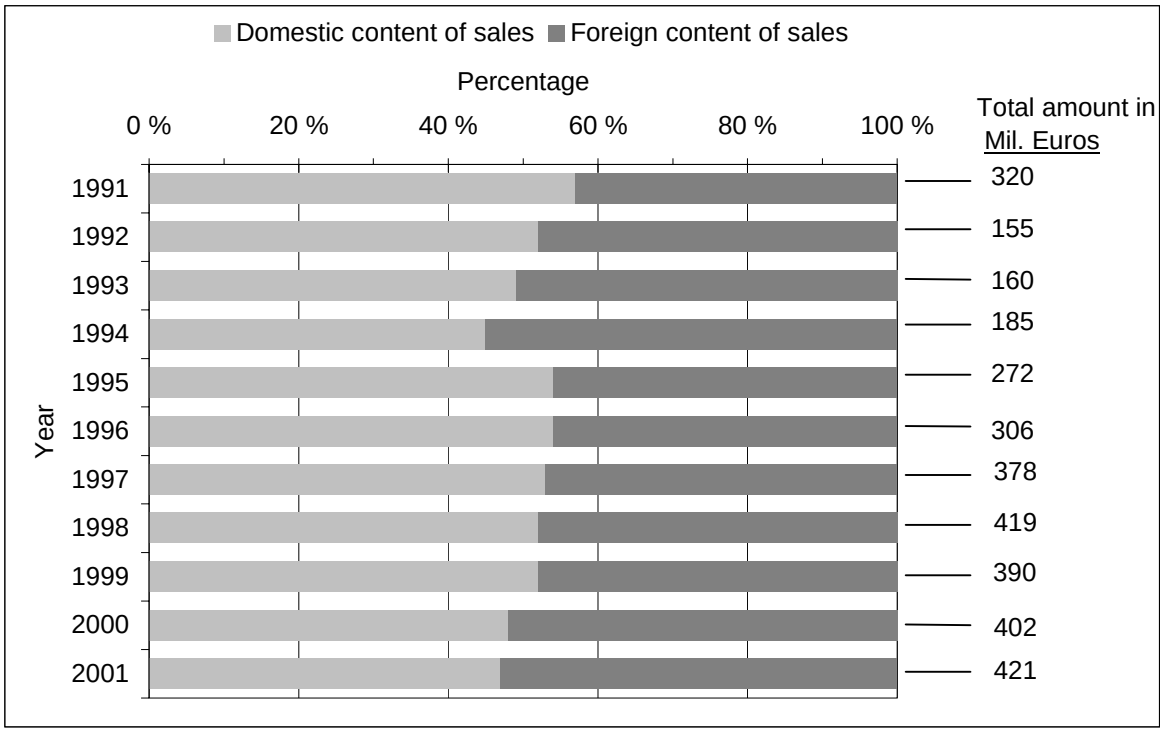

Figure 11. Sales of Finnish-made agricultural machines on the domestic market. Domestic and foreign content of the sales in percentage. Figures from 1991 – 2000 converted from Finnish Marks to present (2004) Euro values.

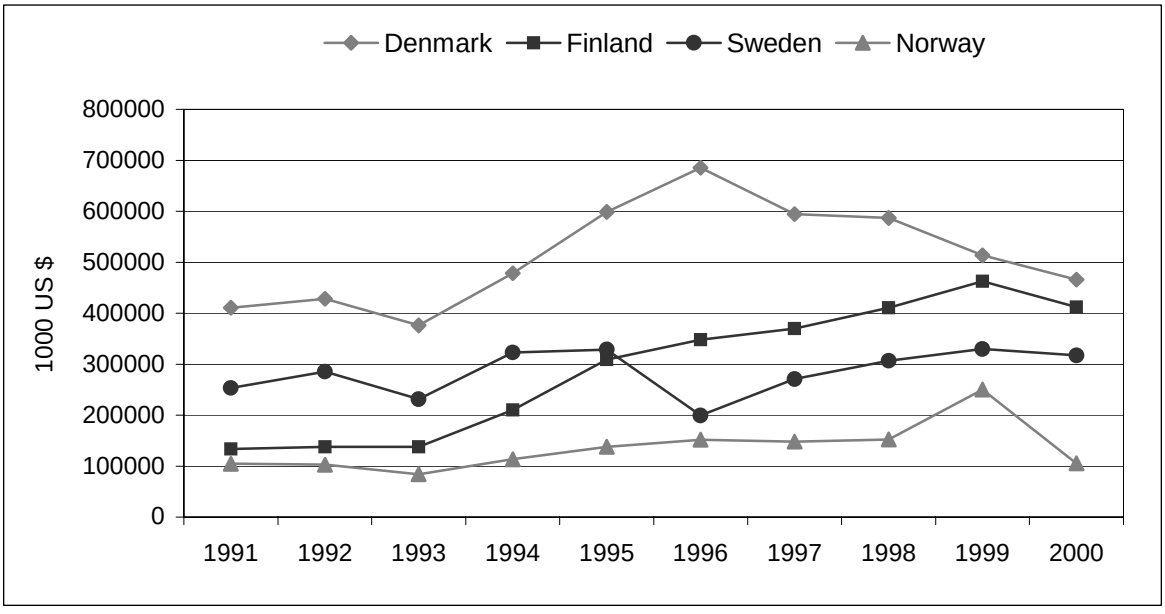

Figure 12. Agricultural machinery export in the Nordic countries. (FAO statistics).

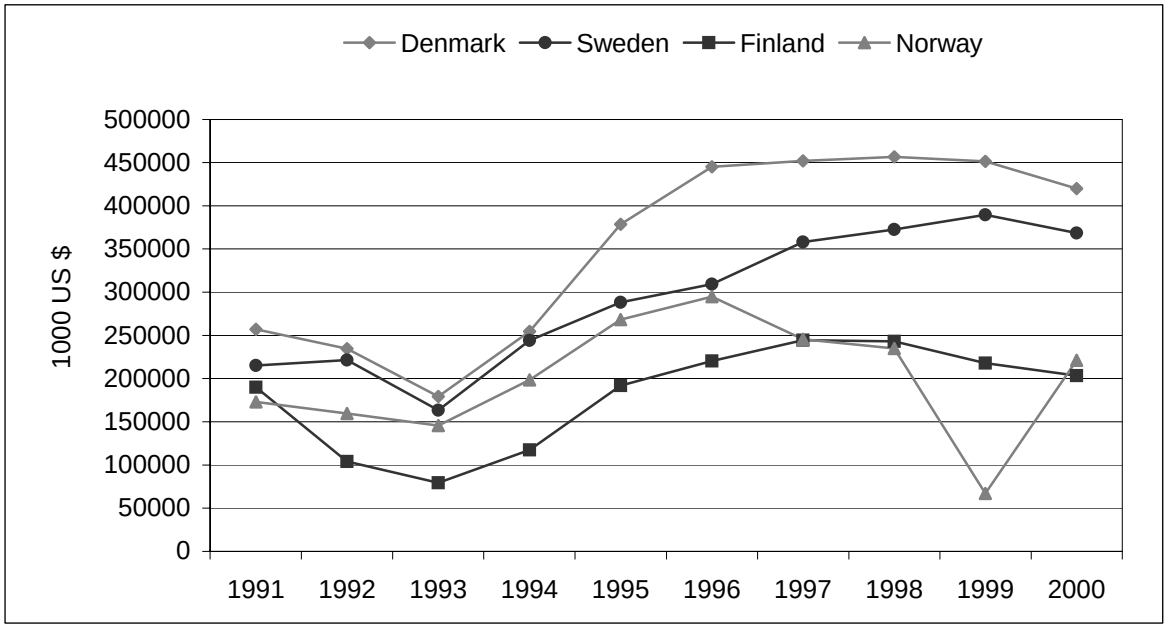

Figure 13. Agricultural machinery import in the Nordic countries. (FAO statistics).

The USA is the worlds leading exporter of tractors and machinery for agricultural and forestry with a market share of 24.9 % in 1997 for a total sum of exports of 2,8 billion dollars. Its sales increased by 17 % between 1996 and 1997 (far more than the world growth). USA is followed by Germany, Italy, France, Canada, Belgium, Denmark, the Netherlands, United Kingdom and Brazil. France is the world's leading importer of agricultural machinery and represents between 10 % and 12 % of the worlds imports depending on the years. France is followed by Canada, USA, Germany, the United Kingdom, Australia, the Netherlands, Spain and Belgium (ISO 2000).

3.8 Patents and standards

Innovation is an important factor in maintaining competitiveness and economic growth, but is of limited value unless this innovation is effectively disseminated. Standards are one means of disseminating new ideas and technologies, and the study by DIN showed that standards have a positive influence on innovation potential and on international trade (DIN 2000). The more patents a country can register, the more powerful and innovative its industry is deemed to be (Bahke 2001). The number of patent applications per million inhabitants in the EU has doubled in 10 years, from 80 in 1991 to 161 in 2001 (Table 2). This varies considerably between the member states. In 2001, it ranged from 367 applications per million inhabitants in Sweden, followed by Finland (338) and Germany (310) to 8 in Greece and 5 in Portugal. Patent applications in Ireland have quadrupled from 20 per million inhabitants in 1991 to 86 in 2001.

Table 2. Number of patent applications to the European Patent Organisation per million inhabitants (* Provisional estimated data for Italy, Luxembourg, Portugal and United Kingdom, Eurostat estimates for EU15 and Greece.) Ref. EUROSTAT, 2003

	1991	1996	2001*
EU15	80	97	161
Belgium	61	94	152
Denmark	90	130	211
Germany	145	178	310
Greece	3	5	8
Spain	9	13	24
France	92	100	145
Ireland	20	39	86
Italy	40	51	75
Luxembourg	104	101	211
Netherlands	108	136	243
Austria	91	98	174
Portugal	1	2	5
Finland	117	174	338
Sweden	141	218	367
United Kingdom	76	82	133

Finland's interests in research and business cooperation extend to all parts of the world: Europe naturally, but notably also North America and the Far East. The reasons are simply quality, access to markets and the benefits of cooperation in relation to the resources at the disposal of a small country and its business and industry: the United States is still the largest producer and commercialize of new knowledge. Japan and Europe are the other leading centers of research and technology. Many developing countries, especially in Asia, are rapidly catching up with Europe, even passing it. At the European level the internationalization of science and technology is currently most tangibly influenced by growing cooperation due to the enlargement of the EU, the European Research Area (ERA) and the Sixth EU Framework Programme. At the same time, the EU member states seek to boost their national research activities by stepping up international cooperation (Science and Technology Policy Council of Finland 2003).

In Finland, the amount of public research and development financing and its relative share of business enterprise research and development naturally vary from industry to industry. The share is smaller in manufacturing than in the services sector, and smallest, under two per cent, in the electrotechnical industry. However, over 40 per cent of government research and development funding is targeted to promote economic development and industry. This share is the second highest in the EU, where the average is 20 per cent. Growing research and development inputs have yielded good results. Finnish research has clearly gained more international presence and visibility during the nineties. Measured in relative terms, Finland is between the fifth and the tenth among OECD countries. A budget analysis (Table 3) made by the Academy of Finland found the following development in re-

sources between 1997 and 2001 according to the actual budgets (Science and Technology Policy Council of Finland 2003).

Table 3. Resources development budget between 1997 and 2001 in million Euros. (Analysis made by the Academy of Finland according to actual budgets. Source: Science and Technology Policy Council of Finland 2003).

	1997	2001	Change, %
Universities	265	350	+ 32
Academy of Finland	95	185	+ 94
Tekes	276	400	+ 45
Government research institutes	196	221	+ 13
Other research funding	211	194	- 8
Total	1 043	1 350	+ 29

The fact that standards contribute at least as much to economic growth as patents is one of the more surprising findings of the research project on the economic benefits of standardization that was published in Germany in 2000. Although there has been quite considerable academic interest in different aspects of standardization, there was no single study that attempted to explain its role in an advanced technology-driven economy and define its impact both on the overall economy and at grass-roots level in business (Bahke 2001). The Fraunhofer Institute that conducted the DIN research was able to confirm that the overall economic benefit of standardization amounts to approximately 1 % of gross national product (1998: USD 15 billion). In summing up, the authors of the study stressed that the positive macroeconomic impact, which far exceeds the sum of individual benefits for the economy, and the savings realized by the state in being able to refer to technical standards, justify public financial support for standards work and make standardization a vital issue in the development both of general economic policy and of specific policies aimed at promoting research and innovation.

3.9 Benefits of agricultural and forestry machinery standards

Today, companies are facing fundamental changes in the way they must do business. Strategies and business practices are continuously being evaluated to determine how to maintain and increase market share, reduce costs, increase productivity and safety, and achieve and maintain a competitive edge. Because of the importance of standards to manufactures, market players try to maximize the benefits they obtain from standardization. The benefits of standardization of agricultural and forestry machines can be looked at from many directions. Standardization may result in benefits in company production and management, product outputs, to consumers or the environment to mention a few. Standardization benefits may be derived from all the stakeholders' point of view. This study however, will consider mostly the benefits of machinery standardization to manufacturers of agricultural and forestry machines. It will as certain instances, discuss the benefits to the users of agricultural and forestry machinery products i.e. farmers, the government and other areas of interest including the environment.

There is no question that the use of standards in developing an product in a company can diminish excess costs, boost productivity, provide for customer satisfaction, reduce development time and increase product quality (DIN 2000, CEN 2002, ISO 2003, ISO 1982). However having said all that, we must also look at the opposing view with respect to using standards in the development process. Over the years there have been many standards developed, some of which were established before there was a demand for them, and others were developed much too late, as the marketplace chose another solution to fulfill its requirements. In either case, standards must be relevant, timely, and good enough to solve a particular industry segment's issues to aid cooperation and understanding between all parties. If standards do not meet these minimum characteristics, there will be no benefits derived from its implementation or use (SFS 2002a).

3.9.1 Benefits to the manufacturer

For economic players, standards are used as a factor for rationalization of production. Through standards it is possible to master the technical characteristics of products, satisfy the customer, validate manufacturing methods, increase productivity and give operators and installation technicians a feeling of security in their profession. Faced with overabundant product or service offers, which may have extremely different practical values, standards provide a system of reference and enable one to assess better, the offers and reduce uncertainties. Standards also enhance supplier-client relations and aid definition of certified product properties reducing the need for additional testing (SFS 2002a).

In Europe, therefore in Finland, standards which come into force apply also to all the products that have been meant for the domestic market. Even though the use of standards is voluntary, products that deviate from the specifics of its own field easily remains outside the market (SFS 2002a). Standards and technology are natural partners for strategic marketing plan, which is clear evidence that standards should be a concern of business managers as well as engineers and technicians. Although the persons involved in standards development process should be fully aware of the significance of standards to their company's success, often this awareness does not extend to the corporate decision-makers. In addition, the decision to participate in standardization is often made only on the basis of how time-consuming and costly this will be. The economic payback of participation in standards development is not always obvious, but the survey by DIN showed that companies actively involved in standards development are more likely to see both short and long-term cost benefits than those that do not participate.

3.9.2 Benefits in production and management

Earlier standardization was used merely for eliminating unnecessary variations in company products. Nowadays the sphere of standardization includes wider sectors of companies' operations and an earlier definition of simply restricting variations has become misleading. Standardization has been realized by management as a support for the whole company, a rationalizing technique and an information tool which co-ordinates its different functions at

both national and international level. Standards aid in eliminating unnecessary functions of the company and in this way free resources that can be channeled to more productive work. Standardization, if carried out right has a positive effect on nearly all the functions of a company. The demands and effects though, vary according to the type of company and its size (Pesonen 1984).

Pesonen (1984) in her article for the sixtieth anniversary celebration of SFS also made mention of a research project on product standardization carried out by the Finnish Metal and Engineering Industries, standards department TES (presently known as the Technology Industries of Finland i.e. Teknologiateollisuus in Finnish) in a big production company, which revealed after systematic standardization adaptation that,

- the product planning time of the company reduced by 50 %,
- the production hours diminished by nearly 30 %,
- the material costs became was also reduced by about 10 %,
- the project paid its costs back after only a few months.

The case presented by Pesonen (1984) above, is a typical example that supports the fact that standardization is an investment alternative worth attention.

It should be possible to evaluate the benefits of the standardization so that the profitability of the different operation alternatives can be compared and the effect of standardization concretely identified by company management. Quite often, the evaluation is made difficult by the fact that the effects of standardization are normally indirect. However, the rough calculations are sufficient to indicate some basic effects and benefits in a companies operation (Kend 1991b).

Currently, when talking about benefits of standards in relation to production and management to the manufacturer, one standard comes into mind, ISO-9000 series. The ISO 9000-series of quality management standards currently include three quality standards, which are all process standards. ISO 9001:2000 presents requirements, while ISO 9000:2000 and ISO 9004:2000 present guidelines. ISO first published its quality standards in 1987, revised them in 1994, and then republished an updated version in 2000. These new standards are referred to as the "ISO 9000: 2000 Standards". These standards apply to all kinds of organizations in all kinds of areas including agriculture and forestry. The ISO 9000 standards represent an international consensus on good management practices with the aim of ensuring that the organization can deliver the product or services that meet the client's quality requirements. Improved communication both internally and externally which improves quality, efficiency, on time delivery and customer/supplier relations is also assured with standardization (Seaver 2002). Nowadays, some customers even look out for some ISO 9000 relations in the products they buy to assure them of quality and some governmental bodies have made it mandatory (SFS, 2002a).

Mr. Ilkka Hakala, the former president of Valtra, in Finland in his review of his company, which develops, manufactures, markets and services tractors of the make Valtra since

1951, made some remarkable revelations. In 2002 Valtra Inc.'s turnover increased by 11 per cent over the previous year. The operating profit also markedly exceeded the 2001 figures. Valtra's unique production concept based on customer orders has raised the company's capital turnover rate to one of the highest in the industry. The company's Finnish manufacturing plants broke their production record. Over 9500 tractors were manufactured at the Suolahti tractor factory and over 27 000 engines at the Sisu Diesel engine factory in Nokia. Behind these figures, the company is the first tractor manufacturer in the world to be granted the ISO 9001 quality certificate in 1993 (Valtra 2003).

For the company, standardization is a necessity without which it would be unlikely to survive, not a luxury or way of increasing profit. The real beneficiary is the economy and ultimately the consumers of a company that systematically incorporates standards in its business. Strictly speaking, the competitiveness of an enterprise is a mix of factors, not just its sales prices, perhaps as always thought of. Competitiveness in the sense is how a company's costs compare with your peers in your served market in relation to product properties (Emond 2001).

Utilizing standards systematically at product development stage and in the operations of the whole company can enhance productivity greatly. Being part of the standards development process allows the company to gain "insider knowledge" and to exert greater influence on the substance of the standards. The participation of company experts in standards preparing groups help to be abreast with technical developments and creates established connections to with companies, authorities and research institutions of the field (DIN 2000). At the same time export oriented companies receive indispensable information about the national specifications in force in different countries. It is to the advantage of company management to obtain information at that stage when standards are been prepared in order to adapt products in time for the market. Also on the other hand, companies who are active only on the domestic market need to follow standards related to for example dimensions to ensure product compatibility, safety etc. On the nutshell, the need for standards and standardization is the same; whether a company is export oriented or not.

3.9.3 Benefits in manufactured products

Standards set the recognized level, and provide a yardstick against which products and practices could be evaluated. Standards serve as a guide for production and provision of goods and services and provide the basis for trade transactions. Due to the expectation of consumers that products meet certain requirements, for instance a farmer who wants to connect his new trailer to his old forage harvester, compatibility in this case is very essential. Ease of use of a product without much limitation may increase the popularity of the product. In this case the number of users of a particular product tend to increase when it conforms to standards related to it, for example in the case connectivity. Furthermore, standardizing a product with network externalities can lead to increased individual company profit at the expense of other trading partner as well as increased consumer surplus. In addition, even in the absence of external competition a firm may still want to license its

proprietary technology. This implies creating competition, increase quality and thereby lowering prices of products (Kende 1991a).

Standards can be most beneficial when it comes to applying them to product development. If products e.g. implements, were not standardized in the sense of compatibility, they would add significantly to waste and costs. Every tractor brand will still have had its own power take-off shaft (PTO) design meaning that the same tractor company has to produce all the farm implements operated through the PTO. High-output specialized machines would not have been developed, because one company cannot specialize if it has to produce all equipments that will be used by or applies to his product. Without standardization, there could have been no mass production or outsourcing or even buying a standard s-tine of an agricultural implement to replace worn out ones. Products would cost many multiples of what they cost today; and that is if one considers the cost-reduction element of standardization. Companies accrue various benefits by participating in the development of standards. This is an advantageous place to get information for the manipulation of products still under development. However, the final benefits by companies come about when the standards are published and accepted by the user community (DIN 2002). Standards can be particularly helpful to the small and medium scale industries many ways.

3.9.4 Reduced product development time and costs

The more widely a standard is used, the easier it becomes to find experienced personnel that know problems, and have tried and true solutions for the common issues that occur when using the standard. In this case when standards are revised, personnel and parties involved in the standardization revision ensure that the standards represent a guideline for methods that are known to work well.

For example, if a sugar beet harvester manufacturer wanted to go into manufacturing a new generation of his products. Experts will have to design and develop the new product, followed by evaluating the safety of the new harvester. This requires extensive and repetitive testing. However, knowing that CEN has published a standard, EN 13140 *(EN 13140/ SFS-EN 13140; Agricultural machinery. Sugar beet and fodder beet harvesting equipment. Safety)*, will help the experts know the safety requirements leaning on the EN standard as a support or framework. On one hand, the harmonized European standards, which are made known and the same for all members make export within these states easier. On the other hand when the manufacturer wants to export the product to a particular country without harmonized standards, the standards pertaining to that product and its safety has to be adhered to, in order to market the products in the foreign country; an addition to the cost of production.

Getting to know which standards will be enforced in the future is an advantage to a company, especially knowing what requirements apply to the type of machine the company manufactures. Furthermore, economic risk of research and development is lowered when a company can influence the content of standards to its advantage. Even if not influence the

contents of standards, the expense of research and developments can be reduced when participants in standards work make their results generally available, eliminating duplication of research effort. The research results by DIN (2000) also showed that cooperation between companies in matters of standardization is advantageous, for the resulting synergy can help reduce costs and increase profits.

Standardization supports the fundamental concept of custom order-build, and mass customization of products, because most products are built using standardized couplings and fasteners. For companies who incorporate a lot of external parts in their machinery manufacture, standardization makes it easier for parts to be pulled into assembly. Standardization in the company's operations itself, will drastically cut down time and cost of operations in product manufacture. For instance, in the manufacture of a particular agricultural implement, there is the need for different tools for assembly, and later for alignment, calibration, testing, repair and service. Tool standardization aids in this, so that a set of bolts and nuts will require the same spanner to loosen, or a number of screws will be of the same shape to enhance the ease of assembly. Similarly, standardization of other components of agricultural and forestry machinery like specification of features such as raw materials, manufacturing process, spray color etc. simplifies product servicing and part replacement (Anderson 2003).

3.10 Other benefits of standards

3.10.1 Protection against obsolescence

Technology is not stagnant; it keeps evolving by day. For the part of standardizing bodies, there will always be the need to revise or withdraw standards. The organizations that create standards, whether government bodies or industrial consortia, are generally highly motivated to provide an orderly way to introduce or replace newer versions of standards. A standardization body that make sudden changes in such a way that investments of its members and companies are rendered obsolete will after a period find itself without the needed support to continue. This indicates that by choosing to follow a standard, you have some level of assurance that as a standard is modified to meet modern requirements, your existing products will not immediately lose its value (DIN 2000). Moreover, all the standardization parties are in the same situation and the same level. By adding support for standards to products, the useful life of the product can be extended. For example, before a specific product standard is phased out of the system, an ample amount of time or prior notification is given, moreover decisions are made on consensus involving all the players of the field.

3.10.2 Product safety and liability

Each year many children and adults are injured as a result of machinery that are defective, unsafe or fail to meet prescribed construction, performance and design standards. Companies that manufacture, import or sell defective goods or goods that do not comply with mandatory standards run the risk of legal actions. If a manufacturer does not follow a stan-

dard, he will be in a less advantageous position because the manufacturer must show the superiority of his solution in the EU new approach system.

Standards are of great use to most countries in drawing up legislation, and are often referenced in legal cases for instance amongst the EU member states. Governments are also increasingly introducing new and more stringent regulations to protect consumers in the marketplace. Such laws use a number of mechanisms, but standards frequently play a central role (Temple & Williams 2002). When a case is evaluated after an accident, the essential and safety part of standards pertaining to the machinery in question may form the basic foundation for this evaluation. Because standards reflect the current state of technology, they can help businesses reduce their liability risk. Especially in cases of lawsuit, companies fall on standards as a backing to prove the safeness of their products.

Standards create market acceptance by providing assurances that products are safe to use. The development and implementation of safety standards contributes to the reduction of accident rates, and raises awareness of safety features and practices (Rautianen 2002). Moreover, participation in the standardization process itself increases awareness of product safety. Representatives of safety organizations see their involvement in the standardization process as having increased the industry's awareness of the importance of product safety (CEN 2002).

3.11 Standards and the farmer

3.11.1 Accidents, health and safety of the farmer

There are many ways that the farmer may benefit from standards, however the initial focus here will be on the farm accidents and their impacts. Currently, there are very little research publications that examine the connection between standardization and safety or accidents at work. A publication on cost-benefit analysis by the European Agency for Safety and Health at work explains that the area is difficult to make valid comparisons as data is very often globalized and most often fails to distinguish aspects, which would facilitate specific assessment (European Agency for Safety and Health 1999). There are many factors associated with products manufacture which include standards, and standards are indirectly related to the use of these products such that it is very difficult to single out the effect standards have on accidents resulting form the use of machines. However, one of the few references is in the DIN study, where almost 75% of respondents saw references to standards as underlining the safety of their products (DIN 2000).

Heinrich (1959) suggested that the reason too many accidents were still happening was that most accidents (approximately 85%) were caused by unsafe acts of people rather than unsafe conditions. Eliminating and reducing hazards by the integration of safety and new technology to products and processes has long been a primary method of injury prevention in the agricultural industry (Aherin et. al 1992). Section 1.1.2, annex 1 of the EU Machinery Directive 98/37EC states that machinery must be constructed such that it fits its func-

tion and can be adjusted and maintained without putting persons at risks when these operations are carried out under the conditions foreseen by the manufacturer. It further goes on to elaborate on some principles of integration of safety principles during manufacture. It states that in selecting the most appropriate methods in manufacture, the manufacturer must apply these principles in the given order:

- eliminate or reduce risks as far as possible (inherently through machinery design and construction),
- take the necessary protection measures in relation to risks that cannot be eliminated,
- inform users of the residual risks due to any shortcomings of the protection measures adopted, indicate whether any particular training is required and specify any need to provide personal protection equipment.

Leigh et. al (1999) from the Global Burden of Disease project (1997) and the World Development Report, 1993 estimated that 100 000 000 occupational injuries (100 000 deaths) and 11 000 000 occupational diseases (700 000 deaths) occur in the world each year. Information from the European Agency for Safety and Health at work also showed that work-related accidents in 1998 and 1999 cost the European Union 150 million working days per year, with another 350 million days lost through work-related health problems totaling a loss of 500 million days per year (European Communities 2003).

Figures 14 and 15 shows the number of accidents occurring per 100 000 self employed agricultural workers in Finland between 1991 and 2001 (Registered under the farmers' employment accident (workers' compensation) insurance scheme. From figure 16 it can be seen that construction and agriculture tend to have a high number of recorded accidents in Europe. This may be attributed to the generally accepted fact that accidents in larger companies and with more 'standardized' behaviour such as manufacturing factories and process plants are lower (European Communities 2003).

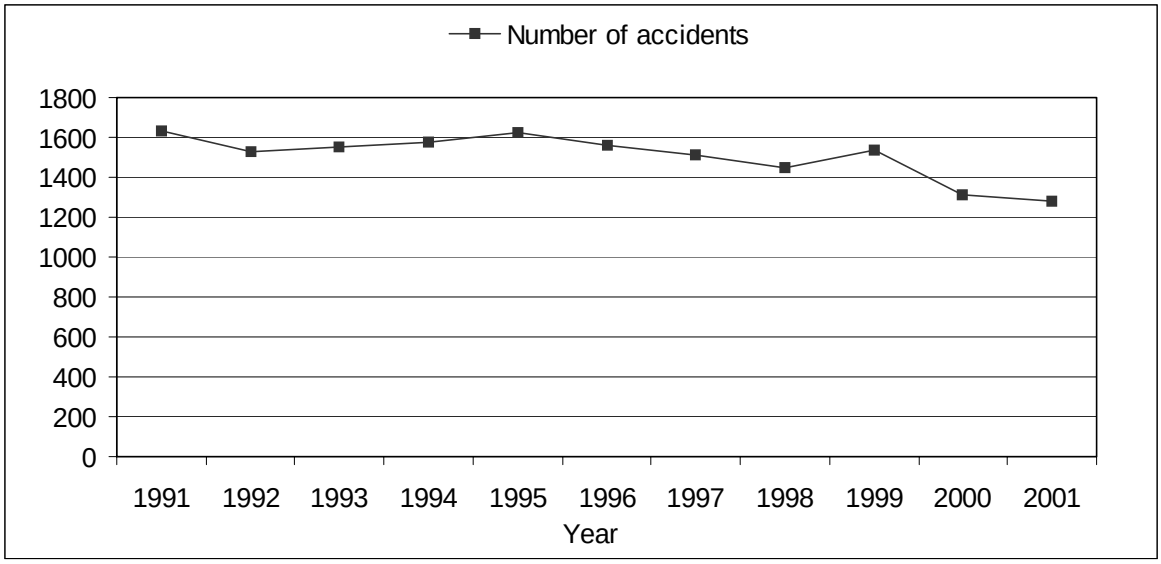

Figure 14. All agricultural accidents per 100 000 self employed workers in Finland (MELA Data: 1991-2001).

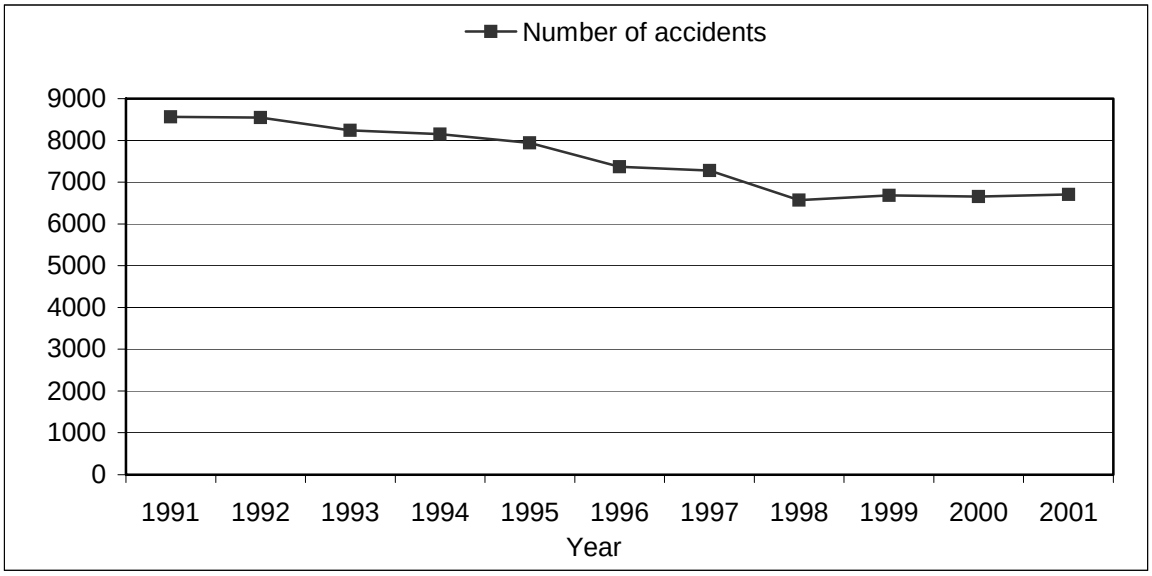

Figure 15. Agricultural machinery accidents in Finland per 100 000 self employed workers (note: all Finnish accident data in this publication is from the Farmers Social Insurance Institution, Finland MELA. The farmers' employment accident (workers' compensation) insurance scheme, MATA, is mandatory for all farmers in Finland since 1982 and MELA has a database of all agricultural injuries and occupational diseases)

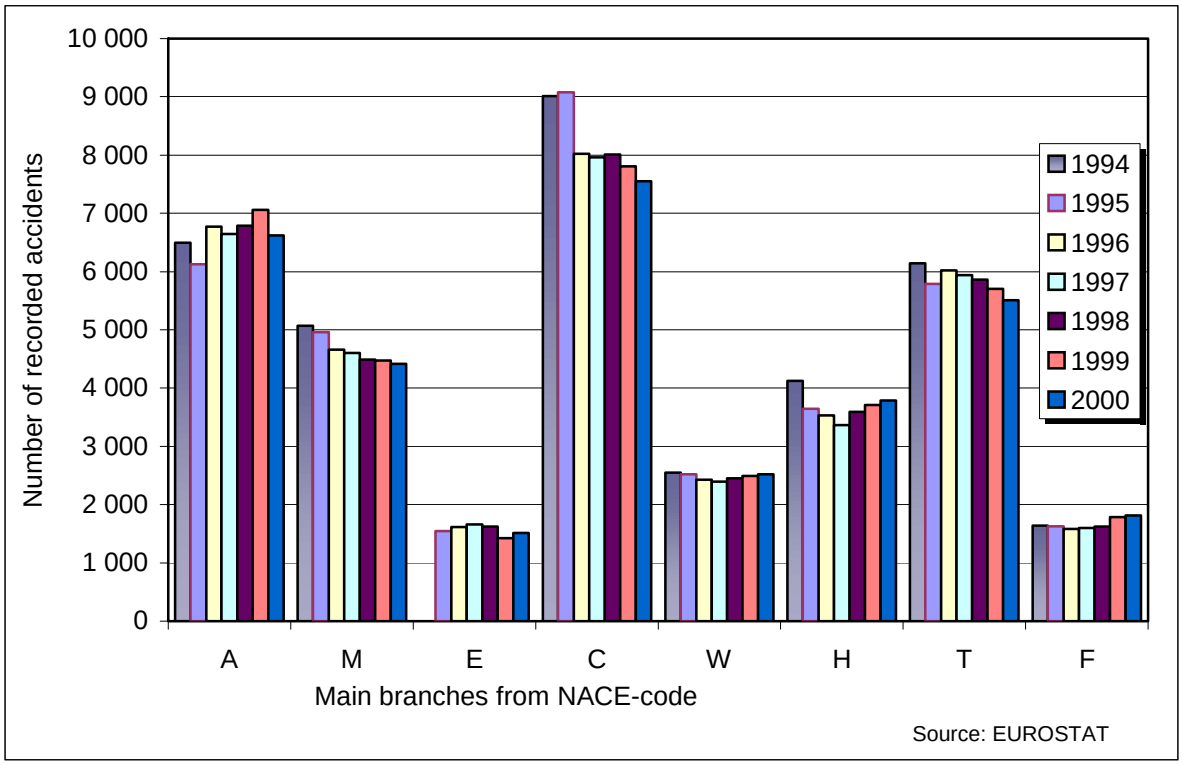

Figure 16. Number of accidents at work with more than 3 days absence per 100 000 workers - by economic activity - EU15 - (European communities 2003)

A: Agriculture
M: Manufacturing
E: Electricity, gas and water supply
F: Financial intermediation; real estate, renting and business activities
C: Construction
W: Wholesale and retail repairs
H: Hotels and restaurants
T: Transport, storage and communication

The total direct cost of work accidents and diseases in Europe in 1991 (compensated injuries) were around 26 billion Euros. Danish and UK studies that took account of indirect costs (such as the cost of sick leave to employers) gave figures representing 1-3 % of the gross national product (GNP), however there were other negative effects on productivity, suffering of victims, emotional damage etc. which were difficult to measure (European Agency for Safety and Health 1999). Agricultural injury and occupational disease costs were 1,5 % of the gross domestic product (GDP) and comprised 6 % of the labor force in 1996 in Finland. The total injury and occupational disease costs were 0,7 % of the gross national farm income and 2,2 % of the net farm income. The estimated cost of agricultural injuries in the US in 1992 was 4573 billion US dollars, which is 2,8 % of the value of farm sales, and 15 % of the net cash returns (Rautianen, 2002).

Table 4. Estimates of the aggregate economic cost of occupational injury and disease for selected European countries (Beatson and Coleman 1997).

Country	Base year	GDP/NI (Gross Domestic Product / National Income cost as %)
Great Britain	1995/1996	1,2 – 1,4
Denmark	1990	2,5
Finland	1992	3,6
Norway	1990	10,1
Sweden	1990	5,1
Denmark	1992	2,7
Norway	1990	5,6 – 6,2
Netherlands	1995	3,9
Australia	1992/1993	2,6

Virtanen et al. (2003) found that the injury rate for full-time farmers was 46 % higher than the rate for all insured farmers in Finland, which may have led to underestimation of risk in injury statistics since only one half of insured farmers are full-time farmers and estimates on injury risk have not taken this into account (Suutarinen 2003). Figure 17 shows the yearly total number of accidents, and the number of accidents caused by agricultural machines between 1991 and 2001 in Finland.

Occupational injury and disease in agriculture is an area also worth noting. Although the number of occupational injury and disease seems to have reduced from the beginning to the mid of 1990, the number has not changed much after 1995 in relation to the number of agricultural workers in Finland (figure 18 & 19).

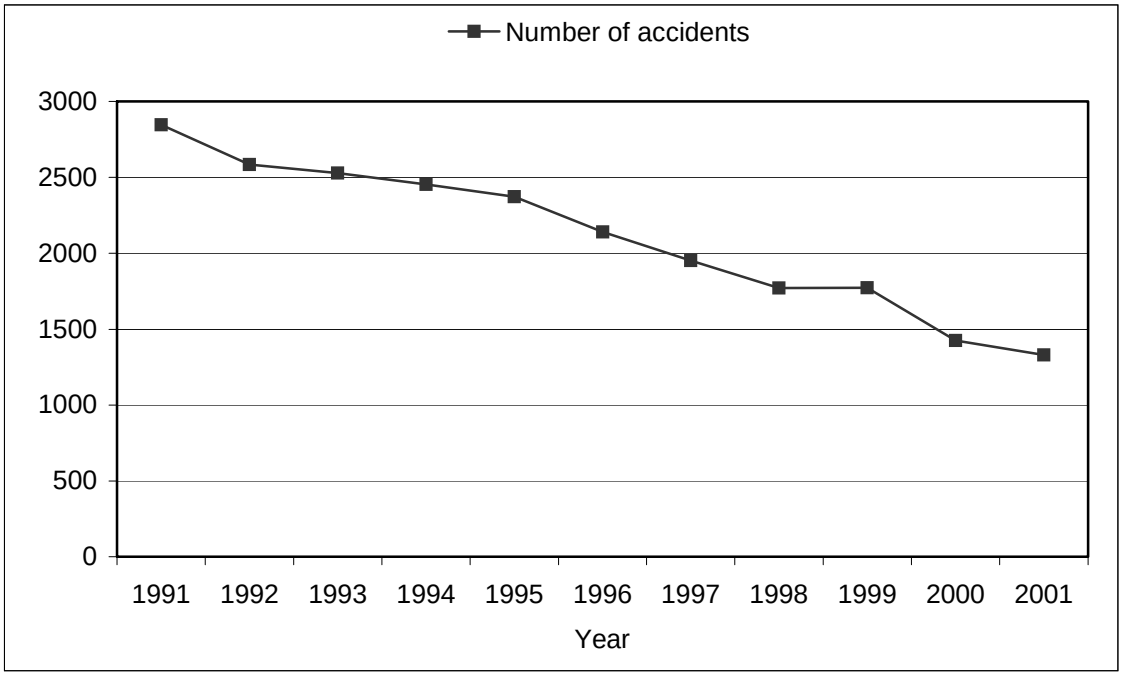

Figure 17. Number of agricultural machinery accidents in Finland (MELA 2003).

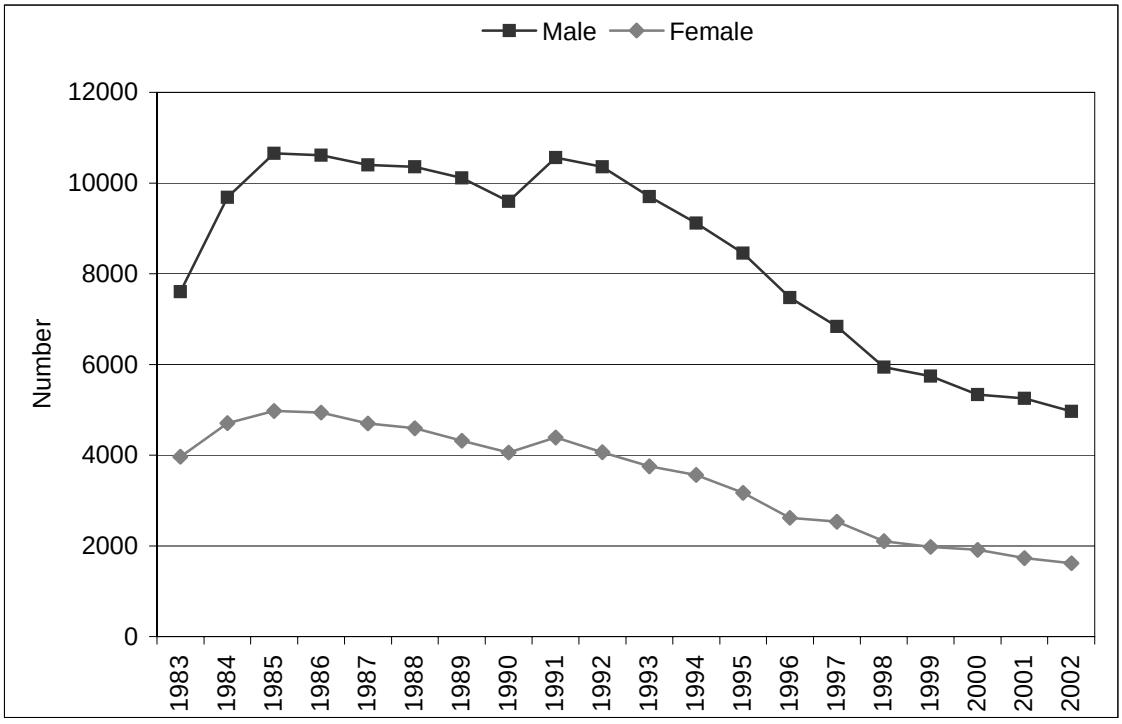

Figure 18. Number of occupational injuries in Finland (MELA 2003).

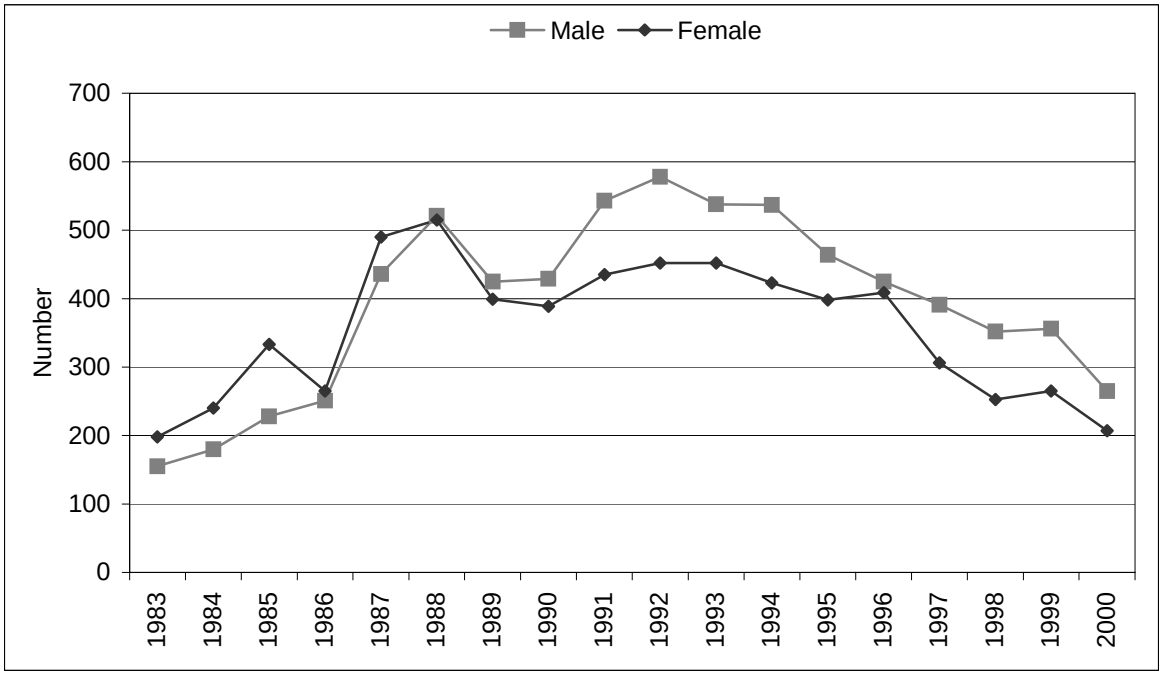

Figure19. Number of occupational diseases in Finland (MELA 2003).

In Finnish agriculture, the working method was found most often to be the cause of accidents (57 %). Other factors that cause accidents include environment 23 %, human factor 11 % and equipment and material factor 9 % (Suutarinen 1988).

Mounting and dismounting the cab caused 42 % of agricultural accidents. Coupling of implements caused 30 % of the accidents. The remaining other work phases each caused only a small percentage of accidents. There was a total of 67 % of all accidents occurring in agriculture when connecting and disconnecting implements, ploughing and tilling, manure, fertilizer and lime transportation and application. May, June, July and August accounted for 68 % of the accidents because of the activeness of farm work during those times (Suutarinen 1992). Figure 20 shows the number of accidents caused by tractors in agricultural production from 1991 to 2001. And figure 21 shows the agricultural machinery accidents occurring in Finland during different farm works.

Roll-over protective structures (ROPS) are proven to prevent fatalities from agricultural tractor overturns. Agriculture had the highest fatality rate in the United States (22, 5/100 000 workers in 2000, 11,6/100 000 in Canadian agriculture) in 1998. Tractor was the leading cause of death (317 deaths in 1998) and approximately 150 overturn fatalities occur every year. In the United States, in 1998 52 % of tractor related deaths were overturns, 24 % run-overs, 5 % power take-off (PTO) related, and 20 % from other causes. In Finland the agricultural fatality rate was lower (6,5/100,000 workers, 1987-1992 average), and the tractor overturn fatalities were rare because rollover protective structures have been obligatory on new tractors since 1969 (Rautianen 2002).

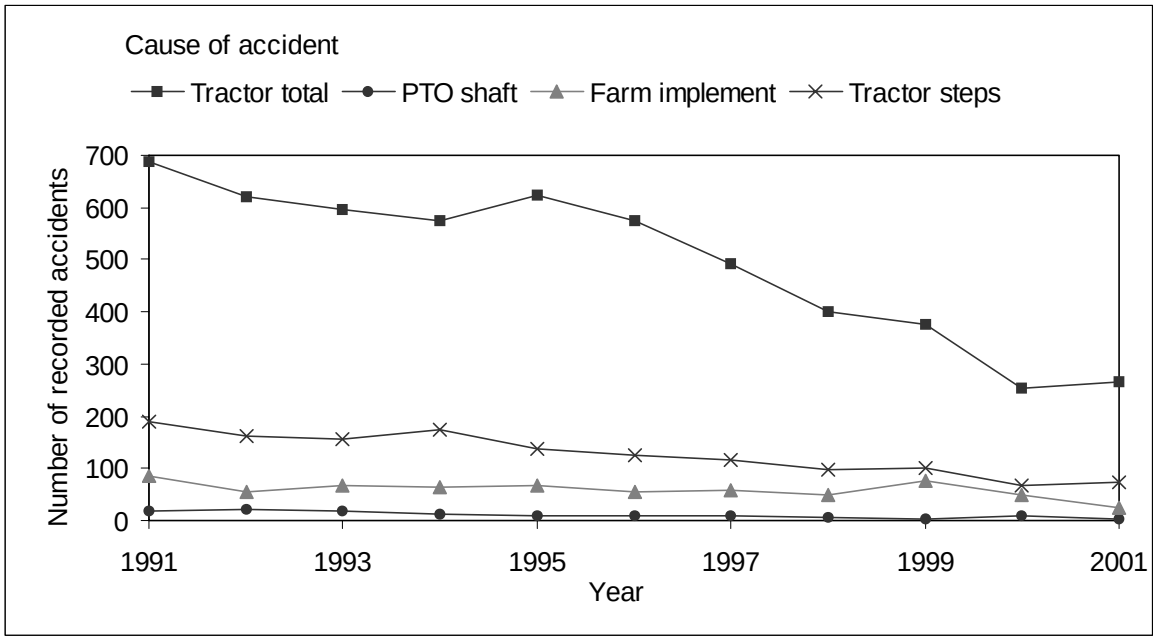

Figure 20. Agricultural machinery accidents in Finland caused by tractors (MELA 2003).

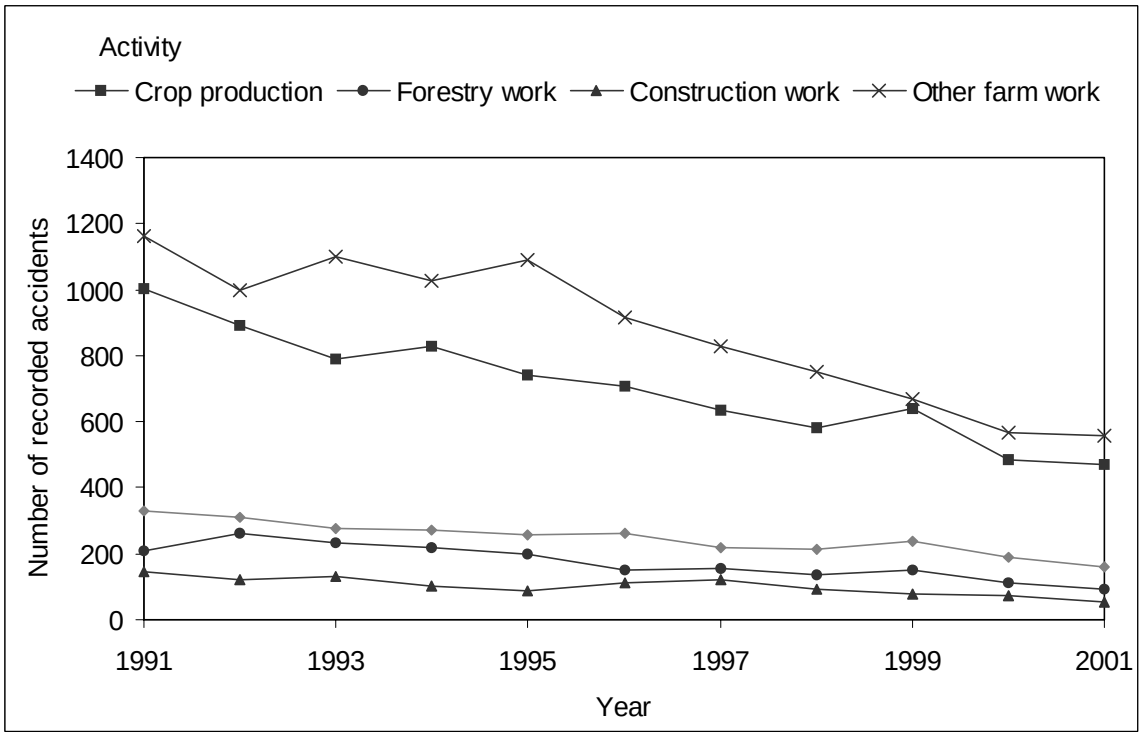

Figure 21. Agricultural machinery accidents in Finland during a specific work phase (MELA 2003).

European standard *EN 1050; Safety of machinery. Principles for risk assessment* and *EN 954 Safety of machinery. Safety-related parts of control systems* were specially developed for use with the European approach for safety through risk analysis. Many other standards may ensure safety such as clearances, guarding, etc. Health and safety at work and the general public interest is a core focus of European standardization. Apart from the fact that a very high proportion of citizens are at work, many items of equipment and tools are used in

both working and domestic environments. For that matter the safety provisions of health and safety at work inevitably overlap with Consumer Protection.

Increases in agricultural accidents in recent years relate exclusively to higher levels of activity and to behavior, not to machinery alone. Increased economic demands that have resulted in changes in farming activity thereby the need to increase profits meaning more working hours have affected accident statistics. Other contributory factors to higher accident rates include the hiring of untrained new personnel, more severe competitive pressures in production, cuts in training and safety costs and a rise in casual and contract/subcontract working. Machinery became secondary as a causative factor in accidents and the vast bulk of accidents and fatalities are now because of lapses and errors in human behavior. A high proportion of those accidents which are attributed in official statistics to 'machinery', result in fact from the improper use of machinery (Aherin et al 1992).

The general public good is very well served in health and safety at work by the standardization process. As a result of standards relating to the present noise, vibration and radiation directives, together with ergonomics standards to obviate musculo-skeletal disorders, the numbers of accidents and disabilities relating to machinery has reduced to some extent. Standardization together with regulatory work may be shown to have prevented many hundreds of thousands of fatal accidents and perhaps thousands of deaths for example in tractor overturns over the past 20 years (Rautianen 2002). There are few negatives if any, but it is worth stressing that wider participation of parties other than manufacturers in standardization might speed up the incorporation of proven techniques and technologies into standards for more immediate safety results.

3.11.2 Other benefits of standards

Consumers will normally notice the importance of the standards actually when the standards are missing - when parts do not fit in their right places and when component parts do not agree. Standards facilitate interchangeability of products and services designed for the same purpose and ensure that products or services perform the functions they are manufactured or provided for (SFS 2002a). Due to the fact that standards are employed in legal systems in a country, competition is increased when companies focus on providing standardized products as well as other additional features of products, which will give an upper hand in the market (DIN 2000). Contrary to conventional wisdom about the reduction of variety in the market, standardization with its effects on trade and customization offers consumers more choice than ever before (Anderson 2003). Standards ultimately reduce costs for consumers. Mass produced goods have always been cheaper than the alternative custom-made products. Standardization has given the buyer access to products that were never before affordable (Anderson 2003).

Quality assurance, which is related to quality standards, provides a significant benefit of standardization for ensuring safety and smooth operations for product users. If the consumers can trust the fact that the product fills the properties that have been defined in a

standard and that the standards have also been drawn up taking into consideration; him as the user, this is really a benefit of standardization for him. In addition to quality standardization of products, information standardization such as in labeling of products also has essential significance to the product user.

3.11.3 Impacts of standardization on the environment

In the past, there was no linkage, formal or otherwise, between the standardization process and environmental considerations. That situation has changed significantly, and further, farther-reaching changes, are under way. The awakening of public interest in environmental matters in the last 20 or 30 years has been reflected by the growing attention to environmental considerations in the process of standardization. With the various EU Environmental programs since the 1970's, environmental aspects have increasingly been addressed in standards (CEN 2002).

The Rio declaration of 1992 gave a considerable impetus to both the regulatory and voluntary efforts of environmental improvement. The European standardizing bodies as well as the international standardizers, ISO all have positive policies to support the environmental improvement aspects of standardization. The European Standardization bodies have adopted policies that call for taking the environmental aspects into account in standards preparation work. They also have been trying to provide the tools to the standardization organizations to enable them to follow this policy (EU Council Resolution 2000). Also, CEN guidelines for Technical Committees addressing the environmental impact of standardization provide a checklist of environmental aspects to be considered at each stage of products' life. These include product life cycle, production and pre-production, distribution (including packaging), usage and finally the end of life of the product.

The ISO 14000 series of environmental management system standards have emerged as the dominant voluntary code of industry environmental conduct at the international level. As firms in both developed and developing countries increasingly adopt these standards, it appears that adherence to the standards may become a de facto condition for conducting business in the global marketplace. While EN ISO 14001 itself does not include requirements that call for environmental improvements, there is an increasing body of case studies published which demonstrate that it indeed has done so and has provided significant economic benefits to companies that has adopted it. A large number of companies have incorporated ISO 1400 series into their production.

4 Results of the questionnaire on standardization of agricultural and forestry machines

The Agricultural Engineering Research Finland (MTT Vakola), a unit of Agrifood Research Finland, functions as a national standards writing body of the Finnish Standards Association (SFS) in the field of agricultural and forestry machines. As part of its work, the MTT Vakola (*MTT Maatalousteknologian tutkimus (Vakola)*) in the spring of 2003, conducted a research survey on the benefits of agricultural and forestry machinery standardization in Finland. Two sets of questionnaires were sent out:

- the international set to some selected standardization organizations in Europe dealing with agricultural and forestry machinery (section 5.2) and
- the domestic set to some users of agricultural and forestry machinery standards and manufacturers of agricultural and forestry machines in Finland.

4.1 Results of the domestic questionnaire

4.1.1 Method

A questionnaire prepared by MTT/Vakola (Appendix 2) was sent to a number of active users of agricultural and forestry machinery standards, and manufacturers of agricultural and forestry machines. The questionnaire sought to obtain information about manufacturers and users perception about standards, the benefits they obtain from using standards and their wishes in agricultural and forestry machinery standardization in Finland.

In all 108 questionnaires were sent by post for answering. Fifty-one questionnaires were returned, of which 45 were analyzable. The companies however, did not provide answers for all the questions. Seven of the analyzed questionnaires were from companies and institutions that use agricultural and forestry machinery standards but do not manufacturer machines. The remaining answers were from manufacturers of agricultural and forestry machines. Out of the 45 questionnaires received from the companies, 7 had less than 5 workers, 8 had between 5 and 29 workers, 7 had between 30 and 99 workers (2 were institutions that just used standards, but not manufacturers), 15 had over 100 workers (5 were institutions that just used standards, but not manufacturers) and 8 did not state the number of workers in their company. The returned questionnaires trend was quite as expected because there was higher response from the larger companies who use more standards and exported more products than the smaller companies with less than 4 workers. The questionnaire was focused mainly on the larger companies (section 3.8.1).

4.1.2 Agricultural and forestry standards usage by companies

The following are the results of the domestic questionnaire. The answers provided in the questionnaires are originally in Finnish, but translated into English by the authors of this report.

***Question 1**: What standards are used in your company?*

From the results of the questionnaire (appendix 2; question 1), 41 companies stated the type of standards they use in their work. Out of those who responded, 5 of them were users of standards but not manufacturers. From those who responded to the type of standards they use in their work 95 % of all who responded to the question indicated that they use SFS standards in their company, 73 % use international standards, 49 % use other national standards other than SFS standards and 27 % have their own company specific standards (Table 5). The results show that SFS standards play a very important role in the agricultural and forestry machinery manufacturers work in Finland. From the response analysis, it was revealed that more than 80 % of the companies (8 out of 41) use at least 1 type of standard, being it company, national, international standards or other specified type of standard (Table 6). For those companies who export their products to foreign countries, international standards play a significant role in their production whilst those who export their products to specific countries pay attention to the standards of those countries where they export their products. Two companies stated that they use other standards than those listed in the questionnaire. The different standards mentioned were ASAE (American Society of Agricultural Engineers) standards, and ETRTO (European Tyre and Rim Technical Organization) standards.

Table 5. Standards used by companies. Total number of response to the question, n=41.

Standards used in the companies	Number of standards use
Standards published by SFS e.g. SFS, SFS-EN, SFS-ISO etc.	39
International standards e.g. ISO, EN etc.	30
National standards of other countries e.g. BSI, DIN, SIS etc.	20
Company standards	11
Other standards (ASAE, ETRTO)	2

Table 6. Types of standards used by the responding companies from the list; SFS, international, other nations, company and other standards. Total number of response to the question, n=41.

Type standards the companies use	Number of responds	Response percentage out of 100 %
1 type standard	8	19,5
2 types standards	14	34,2
3 types standards	13	31,7
4 types standards	5	12,2
All 5 types standards	1	2,4

***Question 2**: How many standards do you buy every year?*

The next question (appendix 1) asked about the number of standards the companies buy in a year. It was noted during the analysis that some of the handbooks are in the form of CD-ROMs. Due to this reason, it unclear whether the question about the number of CD-ROMs

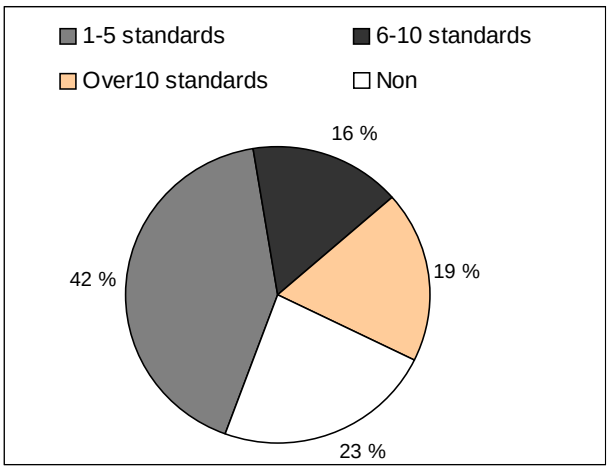

Figure 22. Number of standards bought per year. Total number of responding companies, n = 43.

and handbooks bought by the companies was rightly answered. However, forty-three responded to the question (6 of them were non-manufacturing companies) out of which eighteen (42 %) bought at least 1 standard a year, 15 (35 %) bought over 5 standards every year, whilst 10 (23 %) did not buy standards regularly or did not buy standards at all (Figure 22). The results indicate that there are generally a high number of users of agricultural and forestry machinery standards amongst the responding companies in Finland.

Question 3: *In which form do you buy standards?*

The third question inquired about the form in which the companies buy standards (appendix 1). From the 33 companies that gave answers to the question of which three were non-manufacturing companies, 23 (70 %) obtained standards in the form of a handbook, 9 (27 %) ordered standards on a CD-ROM, 22 (67 %) had it sent to them as hard paper copy, whilst 5 (15 %) obtained standards in PDF form (Table 7).

Table 7. The form in which the companies bought standards. Total number of response to the question, n=33.

Form of standards	Number of responds
Handbook	23
Paper	22
CD-ROM	9
Pdf	5

Question 4: *How do you obtain standards?*

Thirty-six companies gave answers to the question (appendix 2) that addressed the issue on the means through which the companies ordered standards. Out the companies that answered, 3 were not manufacturing companies. From the results it was realized that majority of them (67 %) used the SFS e-trade; an internet service to order standards online. Forty-four percent (36 of the companies) ordered their standards through e-mails, 28 % through the fax system and 6 % got them through other means; mail / post (table 8 & figure 23). Some of the companies indicated that they have standing orders for standards related to their area, which means they obtain up-to-date information about those standards.

Table 8. Means by which companies ordered standards. Total number of response to the question, n=36.

Means of ordering standards	Response by number	Response percentage out of 100 %
SFS e-trade	2	66,7
e-mail	16	44,4
Tel. /fax	10	27,8
Other	2	5,6

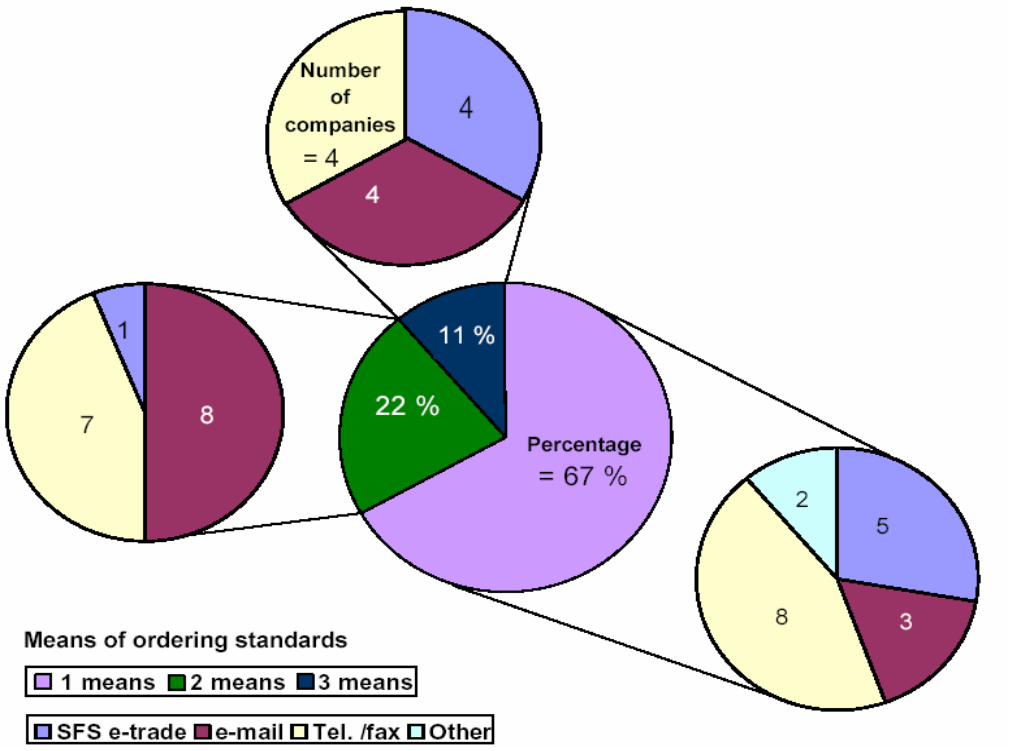

Figure 23. The means through which companies ordered standards for their use. The total number of companies who gave answers, n=36.

Question 5: *How does your company get information about standards?*

Out of the 43 companies who responded to question 5 (appendix 2), ninety-six percent (96%) stated that they presently get information about standards and 4 % indicated that they would do so in the future. From the total number of companies who responded to question 5 (all 45 companies), about one-third (31 %; 14 out of 45) obtained information about standards through participating in some way in international standardization work. A higher number of the companies (38 %; 17 out of 45), got information about standards by participation in national standardization work. (Figure 24). The other ways through which the companies obtained information about standards are through participation in national and international standardization work, from standards writing body (MTT/Vakola) and committees, consultation with standards bodies especially during product development, and inquiries about specific standards on customers demand. More than half of the companies (53 %; 24 out of 45) obtained information about standards through MTT Agricul-

tural Engineering Research, Vakola; the agricultural and forestry machinery standards writing body under SFS. Other ways manufacturers stated as means of obtaining information about standards are through MTT/Vakola's Euro news (eurotiedote) and SFS internet publications about new standards. The following are some typical statements about means of obtaining information about standards given by the respondents:

"We get information from the internet pages of ISO, SIS, etc."

"In the product development phase we get to know the possible standards"

"From the main customers / cooperative partners"

"We take part in the work of MET's (Technology Industries of Finland) materials handling equipment group/CECE"

"We get information promptly from MTT Vakola"

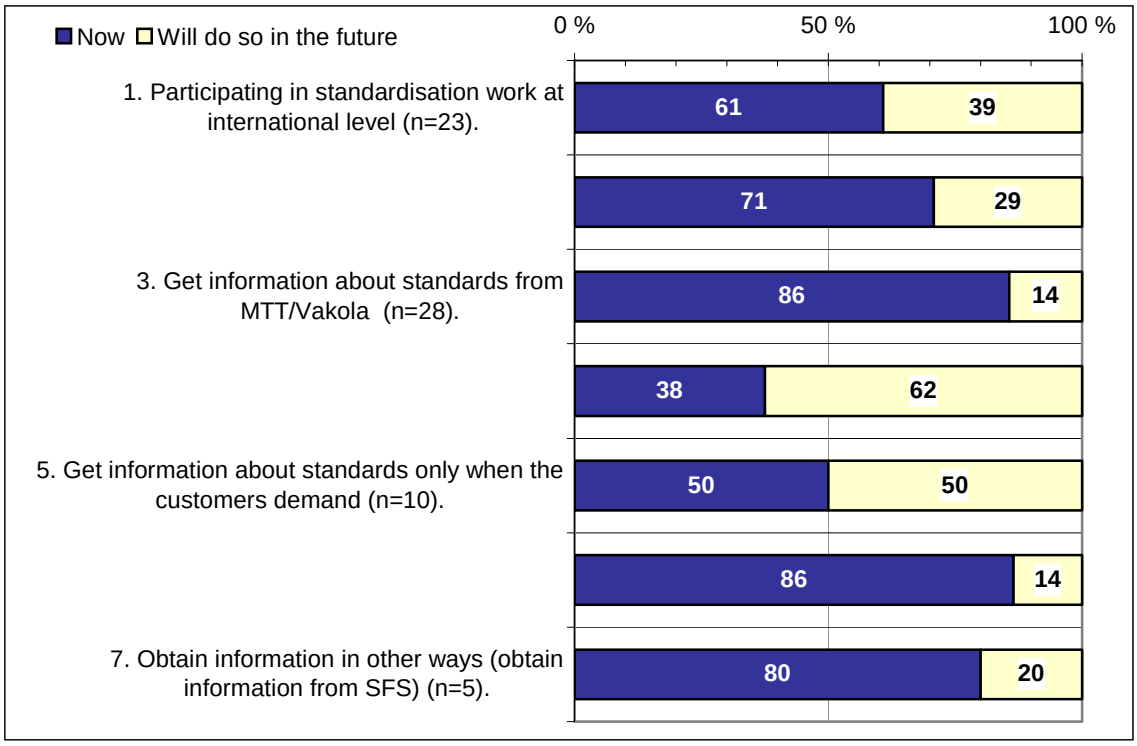

Figure 24. Means through which companies got information about agricultural and forestry machinery standards.

Question 6: *What kinds of standards or regulations do you think will be crucial in the coming 10 years?*

A total of 42 companies ranked at least one standard in their response (Table 9). Out of those who responded, 7 were users, but not manufacturers of agricultural and forestry machines. The companies indicated that European standards would be the most crucial in the coming 10 years and so assigned it the highest rank. National standards received the next highest-ranking average, and 21 of the companies ranked it as the second most crucial standard in the next 10 years. International standards followed next in the ranking (third average ranking) with 14 companies ranking it second and 13 companies ranking it third.

Company standards was the least ranked among the responding companies with only 1 company ranking it first, 3 ranking it second and 17 ranking it fourth (Table 9).

Table 9. Companies ranking of standards that will be crucial in the next 10 years. Total responding companies n=42.

Type of standard	Ranking (assigned rank value)					Total number of response	Average ranking
	1st (5)	2nd (4)	3rd (3)	4th (2)	5th (1)		
National standards (e.g SFS,DIN etc.)	6	21	12	2	0	41	3,76
European standards (e.g. EN)	25	5	8	1	0	39	4,38
International standards (e.g. ISO)	8	14	13	1	1	37	3,73
Company's own standards	1	3	0	17	0	21	2,43

At the space provided for other standards, 1 company ranked European Union directives (which is not a standard) as the second most important in the coming 10 years whilst 6 ranked that space last without providing what standards they mean. Figure 25 shows the average ranking of each category of standards as indicated by the responding companies.

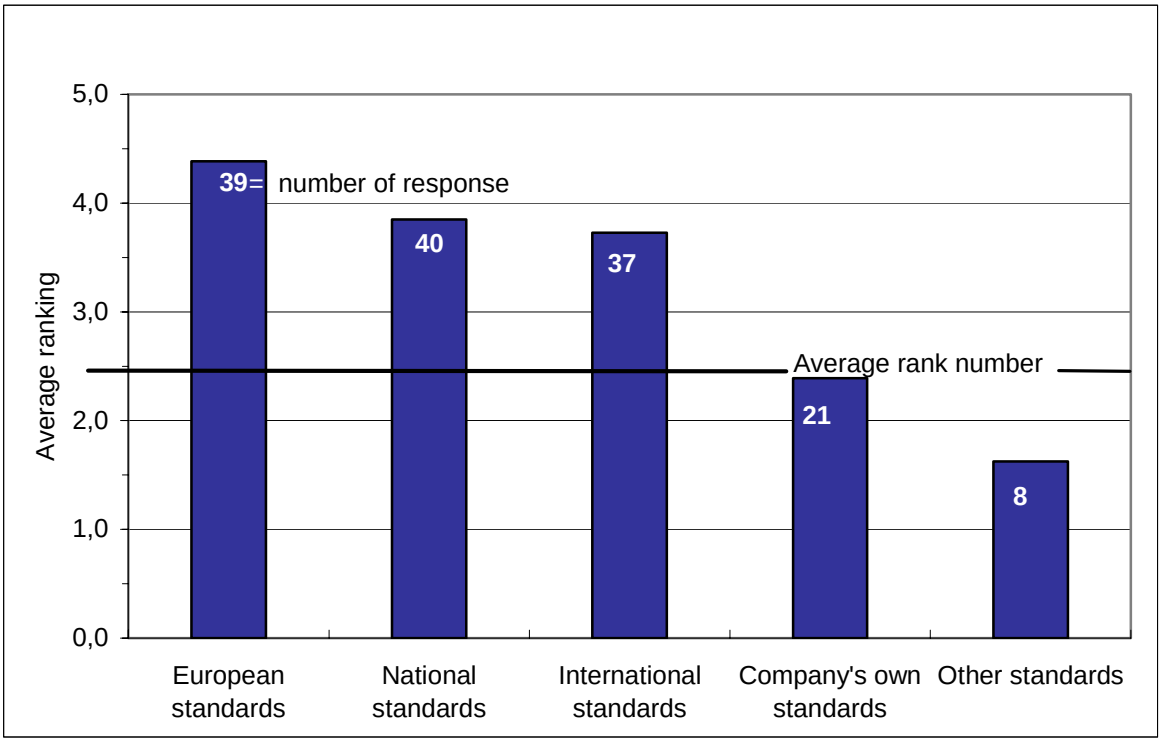

Figure 25. Average ranking by responding companies of standards that will be crucial in the next 10 years.

4.1.3 Participation of companies in standardization

Question 7: *How does your company participate in standardization work at the moment?*

Forty-one companies responded to the question 7 (appendix 2). Out of those who answered, 4 were not machinery manufacturing companies. When asked about participation in standardization work, an average of about 1 out of 3 of the responding companied indicated that they took part in standardization in some way. Participation in standardization at

national level was observed as the highest amongst the respondents. Out of the 41 companies that responded to the question, 29 of them participated in some way in national standardization and 26 in international standardization (ISO and CEN) (Figure 26). Four of the respondents did not however state whether they participated or not in standardization.

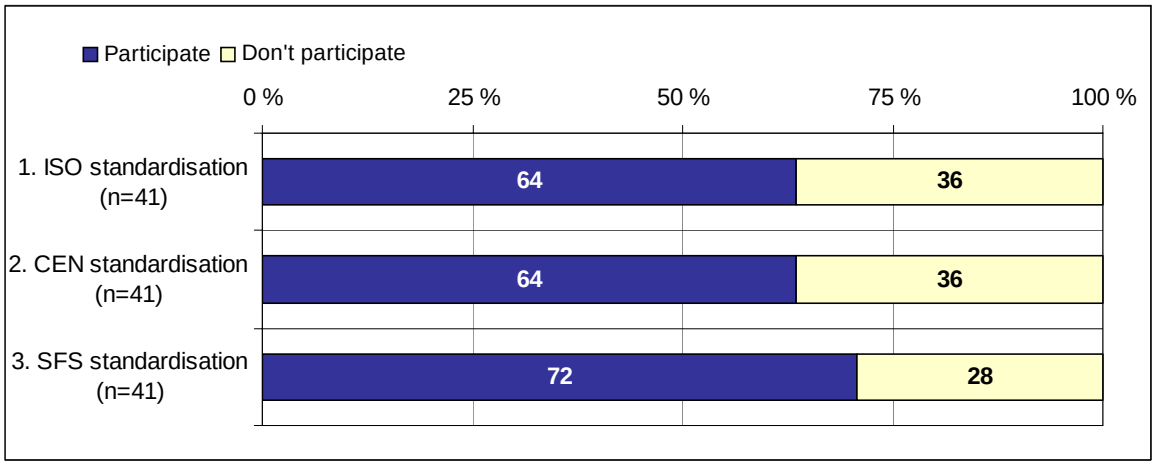

Figure 26. Participation level of respondents in standardization work.

Participation in international standardization was mainly through MTT/Vakola. Although a high percentage of about 72 % of the responding manufacturers participated in national standardization work in Finland, only half of them took active part by participating in standardization committees, forward comments during preparatory work on standards or participated actively in other ways. Out of those who took part in international standardization, about 69 % took active part in CEN standardization and about 46 % took active in ISO standardization work through MTT/Vakola. The rest were just followers or observers of international standardization (Figure 27). Related to this question is a more detail clarification about the specific standardization areas of the companies is given in question 9.

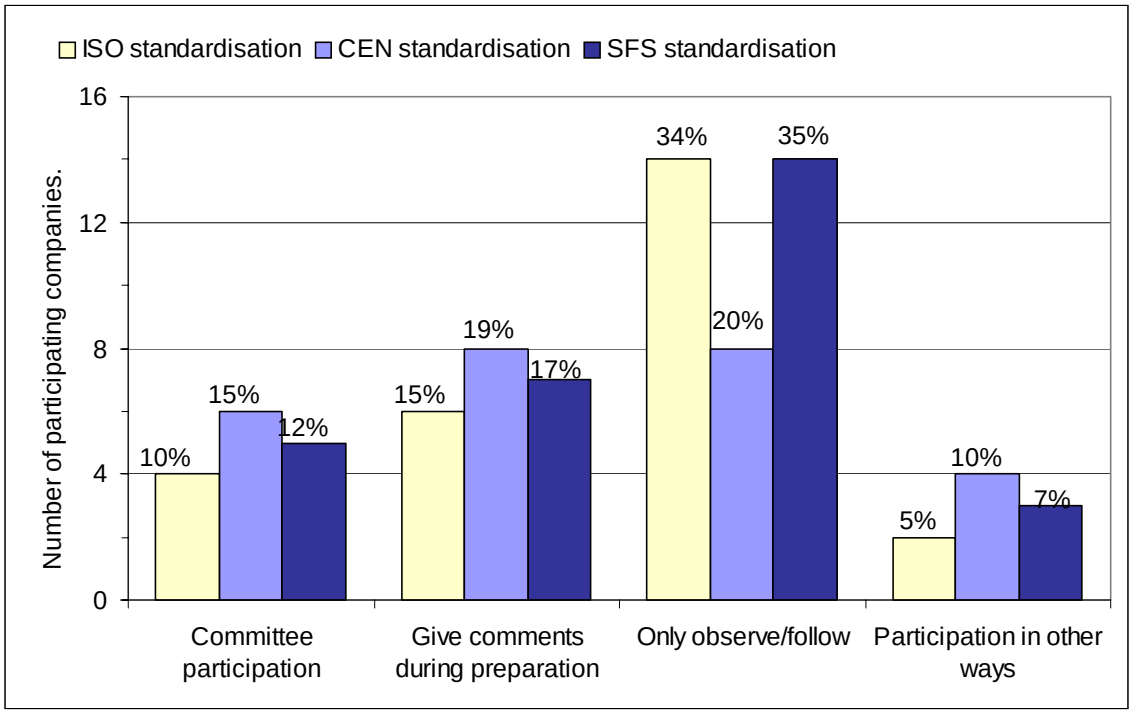

Figure 27. How the companies participate in standardization. Total responding companies n=41.

Question 8: *Estimate whether the standards make business more difficult or they bring new innovation possibilities.*

The next question (appendix 2, question 8) inquired about the companies' perception of the effect of ISO, CEN and SFS standards on their business. Four of the companies that gave answers to this question were not manufacturers of agricultural and forestry machines. From the analyzed questionnaire results only a few of companies indicated that agricultural and forestry machinery standards make their business difficult. Six (6) out of the 31 people who responded to the question about their perception of ISO standards said the standards makes business more difficult for them, two of them said it both brings new opportunities and make business difficult whilst 23 (71 % of the response) said ISO standards brought new opportunities in business. Ninety-four percent (30 out of 32) of the respondents said CEN standards brings new opportunities in business and the rest said it both brings opportunities and makes business difficult. Eighty-four percent (21 out of 25) of the respondents said SFS standards brings new opportunities 12 % (3 out of 25) of them said it both brings new opportunities and make business difficult whilst 4 % (1 out of 25) said SFS standards makes business difficult.

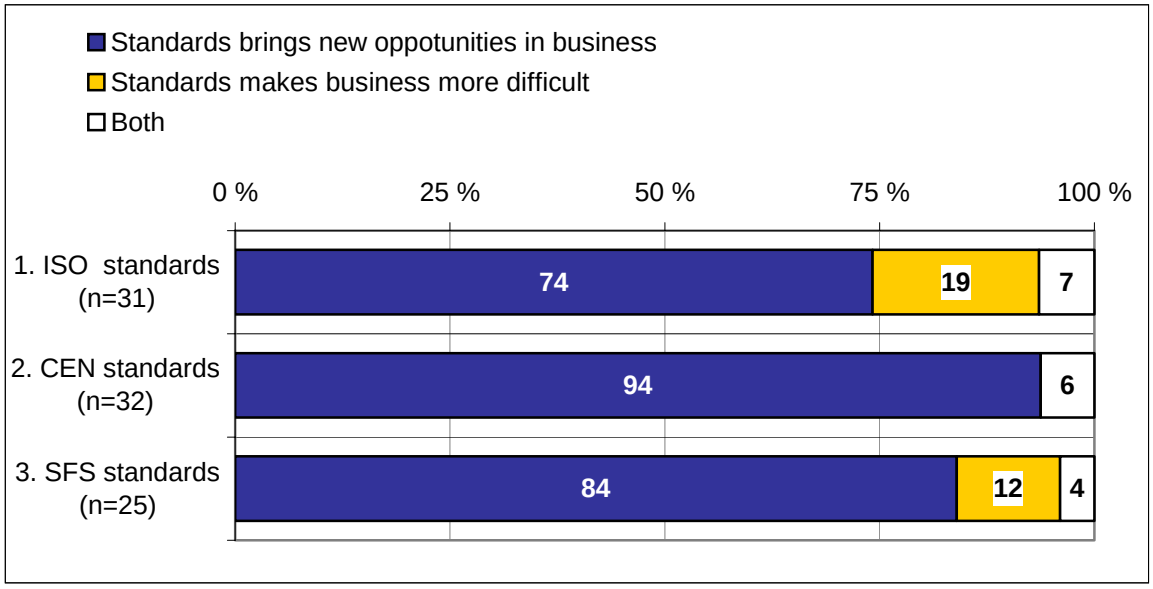

Figure 28. Responding companies perception about the effect of standards on their company.

At the extra provided column where the companies were asked to explain their response to the question (appendix 2, question 8) about whether standards bring new opportunities in business or make business difficult, the following are their comments.

1. ISO standards

> *"Speeds up product development such that the principle can be used in different machine groups for mass production purposes."*
>
> *"Ensures compatibility and interconnectivity between machines. It also helps in different machines to operate together from different parts of the world. ISOBUS is an example of the benefits."*

"Brings new possibilities in the international market."

"Often required for foreign trade. Adapting a product to the market is made easier by use of ISO standards."

"ISO Standards help in legislation and enforcing laws."

"In principle standards bring a lot of new possibilities but to carry them out involves a lot of time for research and development work"

"On one hand, ISO standards bind you; on the other hand they provide numerous structural benefits for your company"

"Saves time and prevents reinvention, i.e. use of classification, signs etc."

"It is easier for manufacturers to manufacture products exactly the way customers want."

2. CEN standards

"Helps standards in different countries in Europe become more unified."

"Shows that the company's activities are organized when used."

"Open doors on the common European market."

"Required for foreign trade and help in adapting a product to the market."

"It is easier for manufacturers to manufacture products exactly the way customers want"

"Clarifies the requirements of products and ensures interoperability."

"Saves time and prevents reinvention, i.e. use of classification, signs etc."

"EN Standards help in legislation and enforcing laws"

"It takes a lot of time for research and development work to design products to meet standards requirements."

3. SFS standards

"Ensures uniformity of equipment and machinery, therefore compatibility is enhanced."

"Adapting a product to the market is made easier."

"Saves time and prevents reinvention, i.e. use of classification, signs etc."

"Shows that the company's activities are organized when used."

"It is easier for manufacturers to manufacture products exactly the way customers want."

"Help in legislation and enforcing laws pertaining to products."

"The effect of the standards are in both ways, one can however not afford to stay outside"

Question 8: *In which areas does your company participate in the standardization work at the moment? Furthermore, estimate how the standards affect business or bring new innovation possibilities.*

On the average, over 75 % of the companies reported that they took part in standardization related to dimensioning, safety, quality and the environment (appendix 2, question 8). About 55 % of the responding companies took part in the preparation of basic standards related components like nuts and screws (figure 29). These results show that environmental and safety issues related to products play an important part in agricultural and forestry machines in Finland.

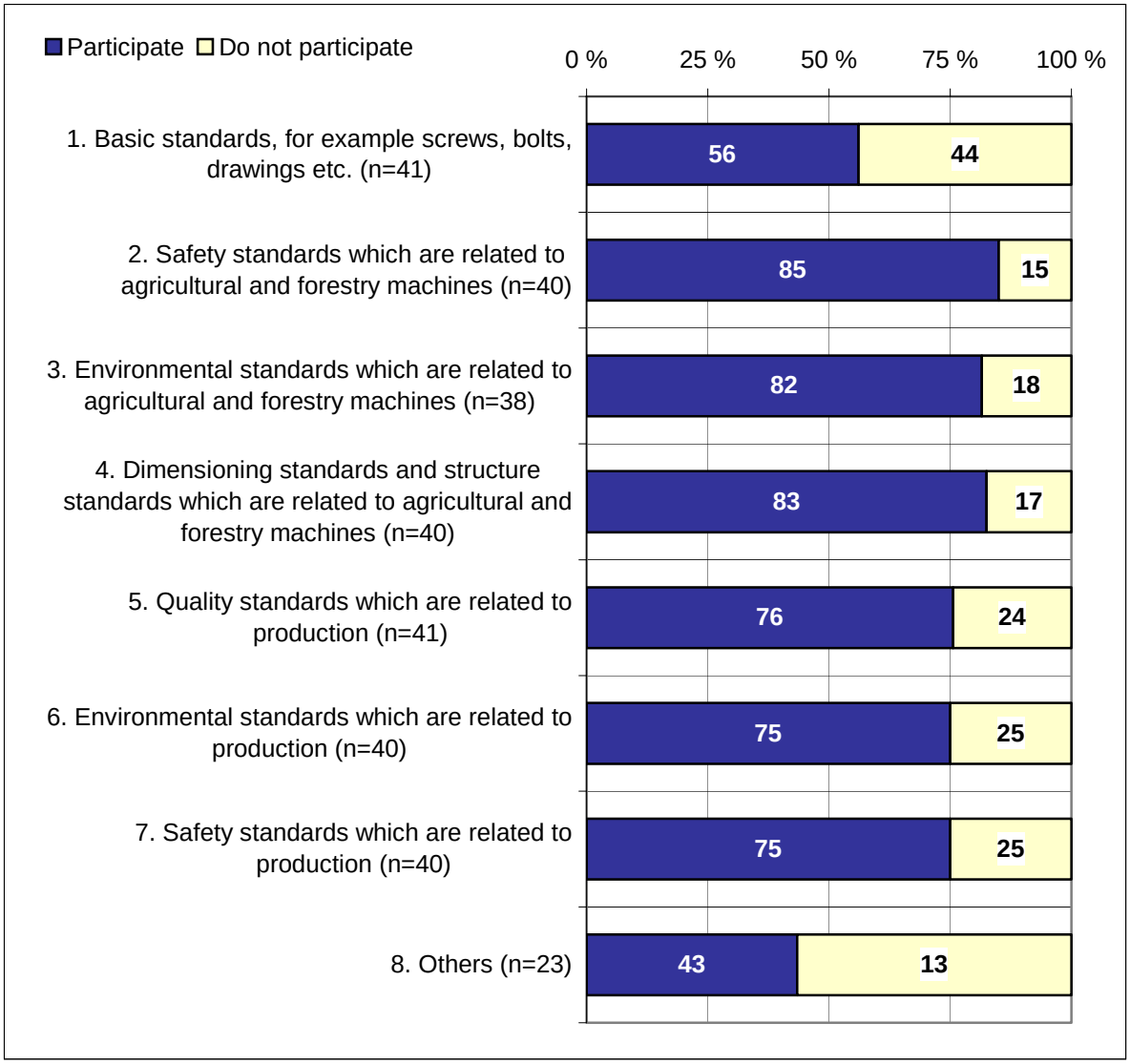

Figure 29. Participation level of respondents in standardization work of different standards types.

Figure 30 shows the number of companies that took active part in standardization work other than just following or using the standards. The results show that there was active participation in standards related to agricultural machinery safety while there was low participation in safety standards related to production and basic standards related to parts like bolts and nuts.

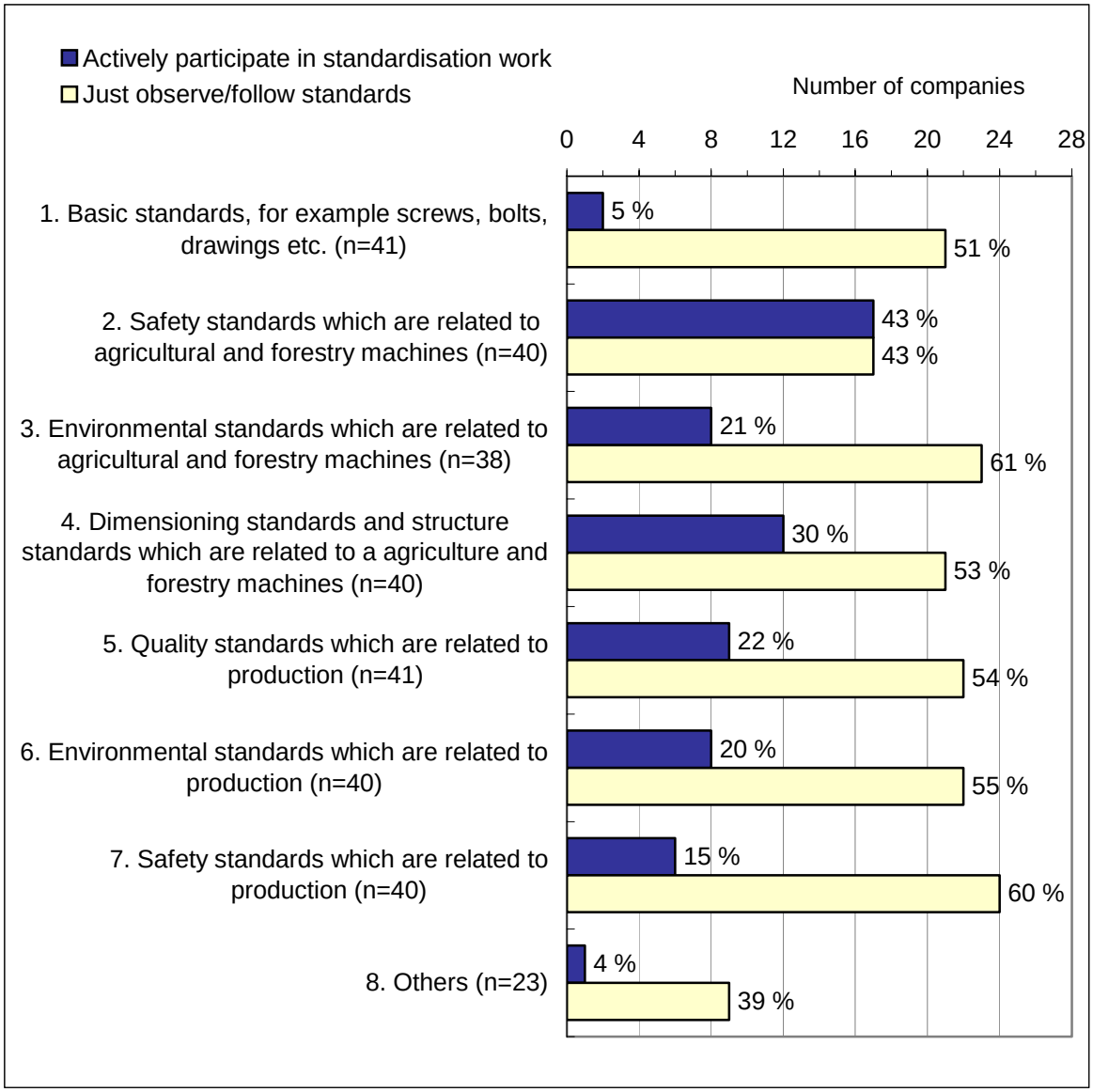

Figure 30. How the companies participate in specific types of standards.

Question 9: *In which areas does your company participate in standardization work at the moment? Furthermore, state whether standard affects business or brings new innovative possibilities.*

Response to question number 9 revealed that amongst the different types of standards, the respondents did not find basic standards, structural standards and quality standards related to production to bring any difficulties in their business. However about four of the respondents found safety and environmental standards related to agricultural machinery, and safety standards related to production to make business difficult (figure 31). Thirty-nine percent (7 out of 18 respondents) of the respondents found environmental standards to make their business difficult. Analysis of question 11 also present what the responding companies think about environmental standards.

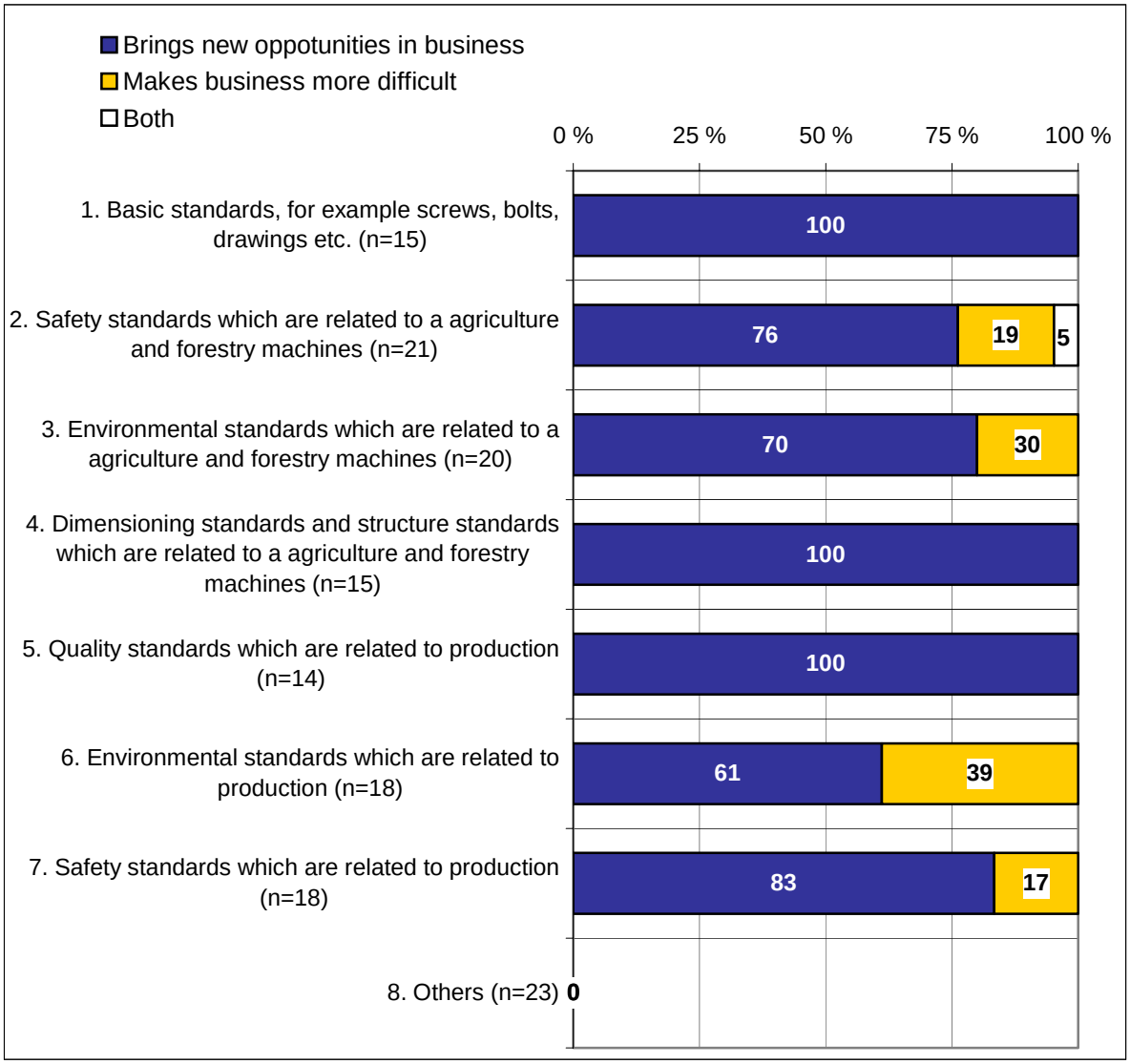

Figure 31. The companies' perception about the effect of different types of standards on their company.

4.1.4 Companies' perception about standards and standard services

Question 10: *State your opinion about the following from your company's experience.*

Question number 10 (appendix 2) gave the companies the opportunity to state their opinion about standards and standard services according to their experience. There was high response to the questions in this section. Half (17) of the companies gave their opinion to the first statement under question 10 which asked about the cost of standards. The other half did not give their opinion. Out of those who gave an opinion, 59% stated that standards are expensive (figure 32). There were two statements from the responding companies stating that the price of international standards were questionable (the prices are too high). When ask what they think the price should be, most to the respondents said standards should be cheaper than they are now, however some of the respondents gave the more specific figures as below.

"The price should be 20 Euros maximum"

"Less than 10 Euros. Including shipment and mailing costs."

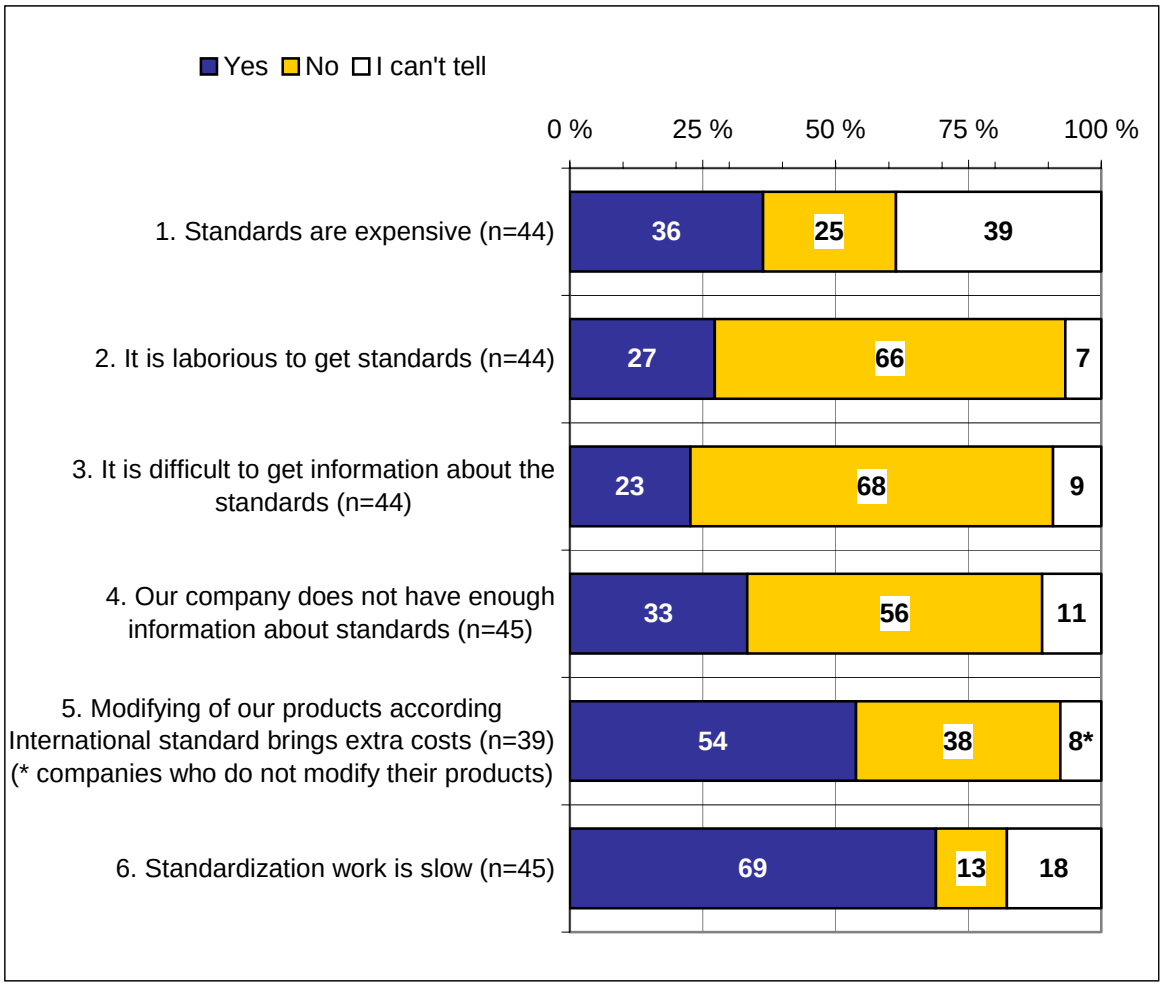

Figure 32. Companies opinions about standards and standard services according to their experience.

Sixty-six percent (66 %) of the 44 companies who responded agreed that it is not laborious to obtain standards. Twenty-seven percent (27 %) indicated that is it is laborious to obtain standards whilst 7 percent did not give an opinion (figure 32). Asked to suggest methods that will make it easier to obtain standards two of the respondents gave the internet as the best means. However, some other comments were given by the companies, which are presented below:

"We are not able to look for the right thing."

"The amounts of standards are too large."

According to 30 (68 %) out of the 44 companies who responded, information about standards is easy to get whilst 10 of the companies (23 %) did not agree to this. Four of the companies that responded did not state their opinions. Three companies gave their inability to obtain information about standards to be due to the existence of too many standards and

another one said the area is too broad to master everything. Others gave technical issues such as:

"Too many references to other standards"

"Language structure is difficult"

"Summaries written in clear language are lacking"

From the obtained results 15 (33 %) of the respondents revealed that their companies do not have enough information about standards. Fifty-five percent (25 respondents) indicated that they get enough information about standards and 5 (11 %) did not state their opinion (figure 32). Asked of the reason for their lack of information about standards, five of the companies stated that they do not have resources for obtaining all the information that is needed to know about standards (one stated the size of the company as the reason and another stated that there is no full time employee to deal with standards in their company). The other reasons attributed to the companies' inability to obtain information about standards are:

"Standards are often difficult to interpret because they are in English"

"Too broad a domain to master"

"We are not able to look for the standard"

"Interpreting standards is too difficult"

"Modifying company products according to international standards bring extra costs in manufacture" (question 10, number 5). To this statement, 54 % (21 out of 39 companies) agreed, 38 % (15 out of 39 companies) disagreed and 18 % (3 out of 39 companies) stated that they do not modify their products. The companies gave various sources of costs and amounts in their production if the products have to be modified according to international standards:

"Changes in costs especially because of the safety standards"

"Costs are from product changes, tool costs, production method costs"

"About 10% extra costs from the product changes plus supplementary material like advertisements, manuals etc."

"Different designs cause extra costs"

"Not great costs because in the end the customer pays the costs"

"Research and development costs; new machine structure raises costs"

"Construction changes and additional components add about +5 %"

"Big difference in different countries, e.g. Road traffic laws bring extra costs"

"Research and development efficiency is reduced to half i.e. cost doubles"

According to experience from their companies', 31 (69 %) companies stated that standardization is slow. Thirteen percent (6 companies) had an opposing view and 18 % (8 companies) did not have an opinion. One of the companies gave a comment that standardization is not slow considering the circumstances around it. However, the other responding companies who indicated that standardization is slow gave the following comments and ways to reduced standardization time.

"By using group cooperation between different industrial sectors"

"Less preparation rounds in the making process"

"It is slow to follow democracy"

"Information (reporting) should be faster"

"Compromises from countries, which on purpose slow down the standardization process"

"Too complicated processes involved (use simpler stuff)"

"ISO and EN do the same thing twice, directives mess everything up for the third time"

4.1.5 Benefits of standards to companies

Question 11: *What in your opinion are the benefits of the standardization to your company? (Possibly giving reasons for your answer and give figures where relevant).*

In question 11, the manufacturing companies were asked to state their opinion about some statements on benefits of agricultural and forestry machinery standardization with respect to their company (figure 33). The analysis of the results in this section was made without the companies who did not respond (an average of about 2 out of 45). The distincting or separating line was placed between those who agree to some extent (strongly agree and partly agree) and those who disagree to some extent (strongly disagree and partly disagree) to the statements, the following was observed.

Hundred percent (100 %; 43 respondents) agree to some extent that safety standards clarify safety requirements of products (number 17, figure 33). Eighty-six percent (86%) are of the opinion that safety standards reduce accidents in machinery manufacture or production, while 7% disagreed to some extent to this statement and 7 % could not state their opinion (number 5, figure 33).

Hundred percent (100 %; 45 - all respondents) agree to some extent that safety standards reduce accidents when machines and devices are used (number 4, figure 33). On that statement, one company indicated that to them *"safety is the most important thing"* in their products. Another also gave a comment that *"safe working practices are the most important"*.

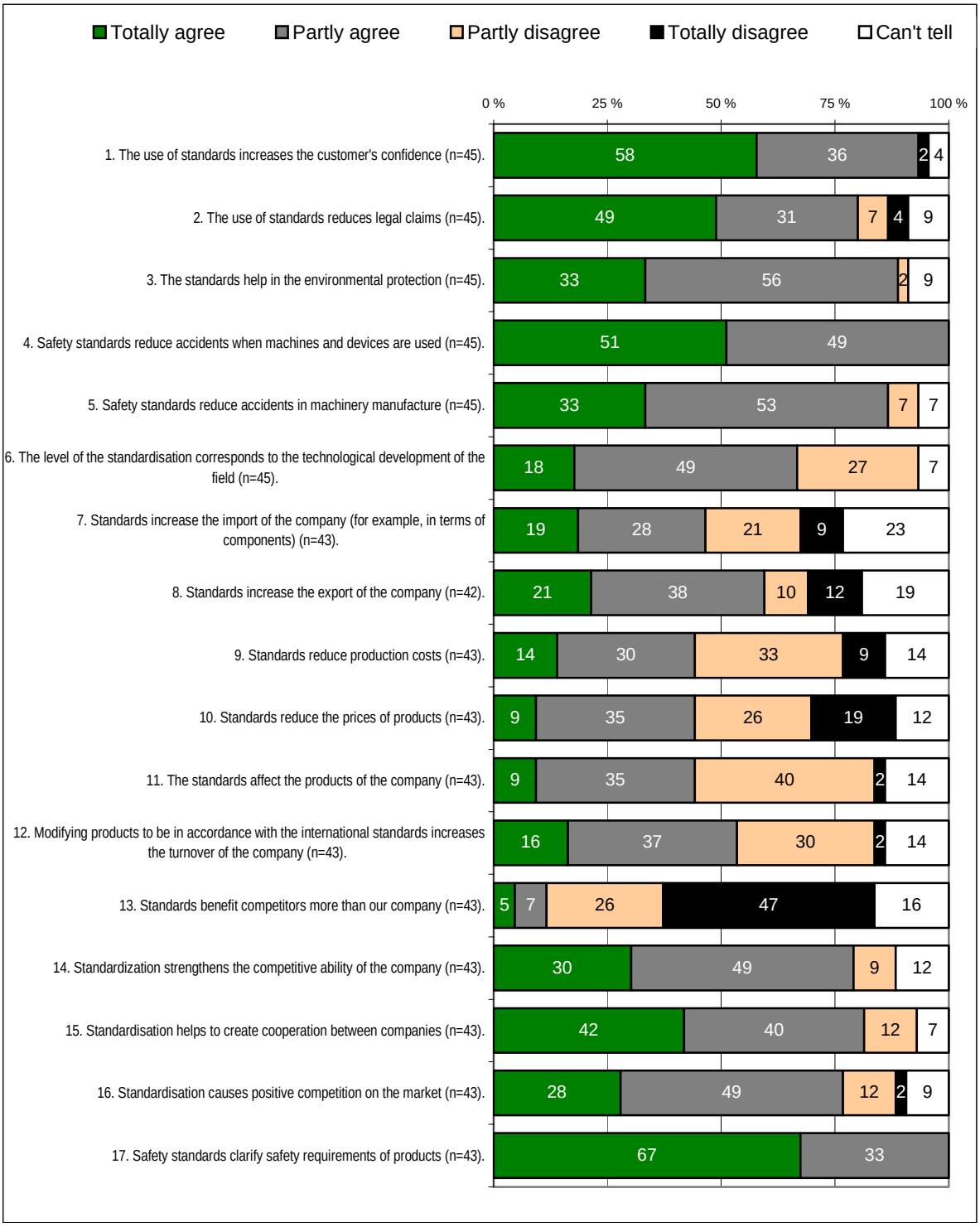

Figure 33. Companies' opinion about some statements concerning the benefits of agricultural and forestry machinery standardization.

With regards to the environment, 89% (40 out of 45) of the respondents are of the opinion that standards help in protecting the environment. One of the respondents (2%) partly disagreed to the statement about standards helping in environmental protection whilst nine (9%) could not tell their opinions (number 3, figure 33). Two companies gave comments; one expressed that in standards, usually the minimum environmental requirements are met, whilst the other states that environmental standards are sometimes too difficult to follow.

Only one (2%) of the respondents was of the opinion that the use of standards did not increases customers' confidence in products. Ninety-four percent agree to some extent (24 totally agree and 16 partly agree, out of 45) that standards increases customers' confidence in products. Two of the companies (4%) did not have an opinion about this statement (number 1, figure 25). One company gave the comments that it standards are used; it indicates the product quality and benefits customers in terms of compatibility between equipment. Another respondent stated that "it shows good level of business activity" to the customer.

In the area of standards and legal claims, the statement said, "the use of standards reduces legal claims". Eighty percent (80%) agreed to some extent to this statement, 11% did not whilst 9 % could not state their opinions (number 2, figure 33). Two companies gave comment as follows:

"Some of the standards are mandatory; you cannot do without them"

"Gives clarity with aim"

A set of questions inquired about the benefits of standards to the manufacturer's products and trade. Concerning products of the companies, 44% agreed that to some extent standards affect the products of their companies. Forty-two percent (42%) objected to the statement whereas 14% couldn't give an opinion. This means that from those who gave an opinion (37 companies), about half of them agreed to some extent whilst the other half did not agree that standards affect the products of their company (number 11, figure 33). One company gave an additional comment that "*in the long term, yes*" it affects the products of the company.

Out of the 42 companies who responded to the question about standards reducing product prices, 88 % gave an opinion whereas 12 % could not say anything. Half (44 %) of the companies who gave an opinion agreed to some extent that standards help reduce price of products whiles the other half (44 %) were in opposition to the statement (number 10, figure 33). Also on that statement one company commented that standards raise prices rather than lower whilst the other commenter said standards reduce the prices of products in the long run.

About production costs, 44% agreed that to some extent standards help reduce production costs. Forty-two percent (42%) objected to the statement whereas 14% couldn't give an opinion. This means that from those who gave an opinion (37 companies), approximately half of them agreed to some extent whilst the other half did not agree that help reduce production costs their company (number 9, figure 33)

A higher number (53%; 23 out of 43) agreed to an extent that modifying company products to be in accordance with international standards increases the turnover of the company. Thirty-three percent (33 %; 14 out of 43) disagreed to some extent about the statement and 14 % (6 companies) could not state their opinions (number 12, figure 33). On company indicated that in their opinion *"deviating from standards bring extra costs"*. The other

company that commented also stated that *"when you direct it in the right way"* it increases the turnover of the company.

For import export trade, 34 companies gave their opinions. Higher number of the companies agreed to an extent than disagreed that standards help increase the export/import of the company. However, higher number of companies (25) agree that standards increase the export of the company whiles 20 of them agree that standards increase the import of the company. On the other hand, 14 of the companies disagree to an extent that standards increase the import of the company and 9 of the companies disagree to an extent that standards increase the export of the company (number 7 and 8, figure 25). Some of the companies gave the following comments:

"*In terms of export, lack of standards would be a disadvantage"*

"*The international standards increase export"*

Seventy-seven percent (77 %; 33 out of 43) of the responding companies agree to some extent that standardization positively affect competition on the market. Fourteen percent (14%) disagreed and 9 % did not have an opinion about this statement (number 16, figure 31). However, one of the companies commented that there could be monopoly by larger companies.

Statement number 14, which says "the competitive ability of the company is strengthened by standards" was affirmatively agreed by 77 % of the companies. Fourteen percent (14 %) disagreed and 12 % chose not to state their opinions (number 14, figure 33). One company stated that this is true if standards are *"adopted systematically"* whilst another commented that the *"large companies benefit"*.

Only 5 (12%) of the respondents out of 43 indicated that standards benefited competitors more their companies. Thirty-one (72 % of those who responded) of them said that standards benefited their companies more than their competitors and the rest (7 companies) did not indicate their opinions (number 13, figure 33)

With regards to the statement that "standardization helps to create cooperation between companies" 35 companies replied in the affirmative (83 %), 5 companies disagreed (12 %) and 3 (7 %) could not state their opinions (number 15, figure 33). One company commented that in this case *"you know what you talk about; you have a common language"*.

Sixty-six percent (30 out of 42) of the respondents were of the opinion that the level of the standardization corresponds to technological development of their field of operation. Twenty-seven percent (27 %) were of the opinion that the level of the standardization does not correspond to technological development and seven percent (7 %) did not state their opinions (number 6, figure 33).

4.1.6 Difficulties in using standards

Question 12: *What are your biggest problems when utilizing standards?*

Results from question 12 (table 10) shows that the language of agricultural and forestry machinery standards was the highest ranked problem with regards to standards usage among the companies who responded to the questionnaire. The technical content of standards was also one of the high ranked problems in using standards. Obtaining information about standards and the cost of standards were the next set of ranked problems respectively the manufacturers had with standards. Acquiring standards was the least ranked problem in using standards. Four of the companies stated other types of problems in using standards, which were: time to adopt the standards and slowness of standards preparation. The average rank for the latter given problems by the four companies was 2. Figure 34 shows the average ranking of the problems companies encounter when using standards.

Table 12. A ranking of the problems companies face when using standards.

Problem in standards usage	Ranking (assigned rank value)					Total number of response	Average ranking
	1st (5)	2nd (4)	3rd (3)	4th (2)	5th (1)		
Language of standards	14	6	6	5	2	33	3,76
Technical content of standards	12	10	5	6	2	35	3,69
Cost of standards	6	5	6	6	11	34	2,68
Information about standards	5	11	11	4	1	32	3,47
Acquiring standards	5	8	3	5	9	30	2,83

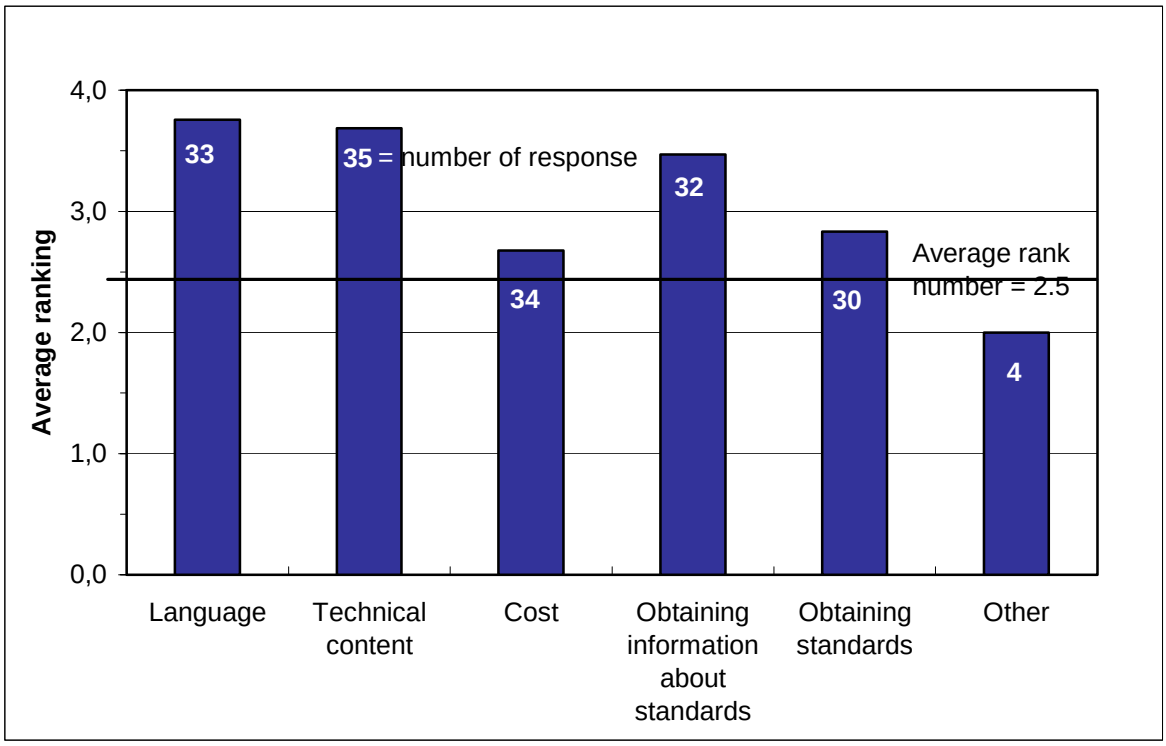

Figure 34. Average ranking of difficulties agricultural and forestry manufacturers have with using standards.

4.1.7 Companies' wishes for organization of standardization

Question 13: *How should the standardization of agriculture and forestry machines be organized in the future?*

There was 92 % (37 out of 40 companies) response acknowledging the continuation of the present system where the standards writing bodies arrange standardization work (figure 35). Eight percent (3 out of 40 companies) however proposed that the national standardization organization SFS takes care of all standardization work. There were no proposals for other ways of organizing standardization by the companies who responded to the questionnaire (figure 35). However, the following statements were given by some of the companies:

> *"MTT Vakola has to continue the work they're doing now"*
>
> *"Different points of views come out well with the present system"*
>
> *"Because the domain is too large, it is meaningful to split work on different groups; most of the significant standards come from ISO and CEN"*

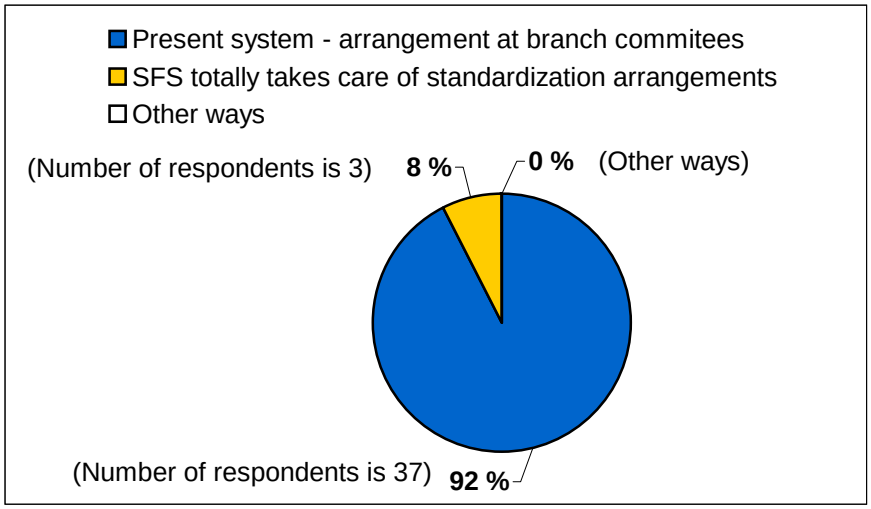

Figure 35. Companies' wises for organization of standardization in the future. Total responding companies n=40.

Question 14: *Will probably you be willing to participate in the preparatory work of standards if the operation becomes chargeable?*

The next question sought to know about companies' wishes for standardization financing that would encourage their participation in standardization work. Ninety-eight percent 98 % (41 out of 42 companies) gave an affirmative response to the present system where financing of standardization work is mainly done by the government (figure 36). Two percent (1 out of 42 companies) however proposed that they would be willing to participate in standardization work if financing is such that the size of the participating company determines how much dues are paid. The also gave the following comment:

> *" Our resources are not enough for active preparation work"*

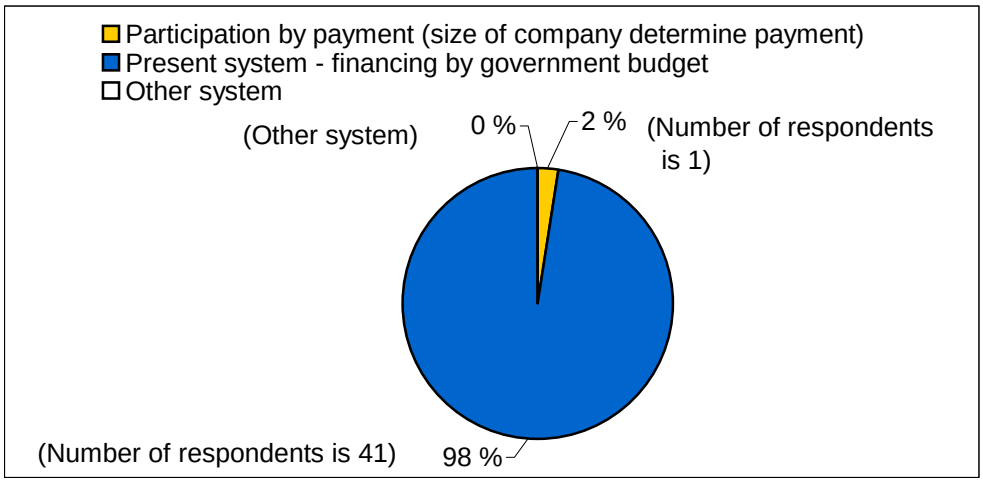

Figure 36. Companies wishes for standardization financing. Total responding companies n=42.

The companies were asked to state in their opinions the other factors that affect standards and the standardization work in addition to the others provided in the questionnaire (question 15). The following is a compilation of the answers given:

> *"Test results should be accepted in the whole of Europe; there should be no need to re-perform tests again in other countries"*
>
> *"Business politics should be taken away form standardization"*
>
> *"Interviewing the users, comparing the number of users, practicality and ease of production has an effect on standardization work"*
>
> *"Building National and Regional obstacles in business"*
>
> *"Personal demands & country-wise interests"*
>
> *"Standards are often a bit old. Developments are not well taken into consideration"*
>
> *"Large manufacturers influence on preparation of standards"*
>
> *"Preparation of standards is sometimes slow; it takes time to go through long approval routines"*
>
> *"EU directives are such that one has to apply standards; they do not however tell which standards to apply. In addition everything is changing too fast; compare machine directives and noise directives"*

Question 16: *What other factors do affect standards and the standardization work in addition to the above questions, in your opinion?*

The following statements were given by the companies when asked to state their wishes and proposals about standardization work at MTT/Vakola:

"Practical ways on how to use the directives. It is difficult to get to the point (always references further ahead and to other standards)"

"It should be possible to simulate small changes to products on which ROPS tests are made. After that VAKOLA should give its statement after comparison between the original product and the new simulated product, which is obtained by strength calculations"

" Our agricultural machinery group wants to continue the cooperation with MTT- Vakola standardization"

" Activity of MTT is going in the right direction. Cooperation between producer-Vakola and users. Vakola's Euro-tiedote is good information about changes, and new standards"

" Technical questions in standards should be specified in a simplier manner. Multi-page standards contain too much information. Difficult to get to the point i.e. it requires too much time to dig out what you need"

" Small and Medium Size enterprises should take more active part in the preparation work of standardization. The language used in the preparatory phase of standards is much clearer than in the ready standards, so preparation is even a better source of information than the ready standards"

" You should offer payable advisory service about standards and directives related to as SMP does in Sweden" SMP Svensk Maskinprovning AB is an inspection, testing and certification organization.

5 Results of the international questionnaire

5.1 Method

A questionnaire enquiry prepared by MTT/Vakola (Appendix 2) was sent to a selected number of agricultural and forestry machinery standardization organizations and national standards bodies in Europe. The questionnaire sought to obtain information about standardization methods in the various countries for agricultural and forestry machinery standardization.

The questionnaires were sent to six countries. Four were sent to the national standardization bodies (NSB) in France (Association française de normalisation, AFNOR), the Netherlands (Nederlands Normalisatie-Instituut, NEN), Sweden (Swedish Standards Institute, SIS) and Italy (Ente Nazionale Italiano di Unificazione, UNI). The remaining two were sent to standards writing bodies (SWB) in the United Kingdom (Agricultural Association of Engineering) and Germany (German Engineering Federation, VDMA) responsible for agricultural machinery standardization in the respective countries. Three filled questionnaires were returned from Germany, France and the Netherlands.

5.2 Agricultural and forestry standardization in Germany, France and the Netherlands

The following is a presentation of the results obtained from the questionnaires about agricultural and forestry machinery standardization in Germany, France and the Netherlands. The standardization principles in agricultural and forestry machines in Finland are also presented in addition to the received answers from the countries.

Question 1: *How and where is standardization of agricultural machinery organized in your country? [The level where national committees / reference groups are organized and comments from the country and votes are formulated].*

The results of the questionnaire indicated that agricultural and forestry standardization in Germany takes place in an industry federation. The results from France and the Netherlands informed that the organization of agricultural and forestry standardization takes place in the national standards body itself.

In Finland, the organization of agricultural and forestry standardization takes place in a research institution (MTT/Vakola). This means that the level at which agricultural and forestry standardization is organized Finland is similar to Germany, and it takes place in a separate institution outside the national standardization organization although its work is still under the national standardization body.

Question 2: *If agricultural machinery standardization is organized outside the national member body, what is the dividing line in publishing standards?*

From the answers received, the response from Germany indicated that agricultural and forestry machinery standards are prepared by the standards writing body (industry federation) and published by the national standards body.

Likewise in Finland, standards related to agricultural and forestry machines are prepared by the standards writing body (research institute) but the national standards body does the publication.

Question 3: *Are there finance provisions for the body preparing the agricultural machinery standards by the national standards body for running national committees and secretariats, preparing comments for international work, translating standards or from sales of standards?*

Concerning finance provisions for agricultural and forestry machinery standards preparations by national standards body, the results from Germany indicated that at the moment there are no financial provisions by their national standards body (Question 3). Also, in Germany, agricultural and forestry machinery standards work is exclusively financed by

subscriptions of standards or membership fees by companies in the association (German Engineering Federation, VDMA).

Response from the Netherlands indicated that the national standardization body makes financing provisions for running national committees, preparing comments for international work and translating standards. However, there were no set aside monitory portions from sales of standards.

In Finland, the national standardization body makes financing provisions for translation of standards and there are also available funds from sales of standards. Furthermore, the national standardization body makes provisions for running the international secretariats. On the other hand, there are no financial provisions in Finland for preparing comments for international work and running national committees and secretariats. There was no response about financing arrangements from France.

Question 4: *Are there any set principles on how to organize or start a new national committee [for a new field of work]? If yes, state the criteria / principles in starting the new national committee.*

Question 5: *Briefly explain how a newly started national committees secretariat is financed*

Question 4 and 5 requested information about principles involved in starting new national committees for a new field of work. It was known clear from the results of the questionnaire that there are rules in Germany for starting new national committees. Some of the general rules are that all interested parties shall be involved, interested parties shall have access and there shall be information to the public concerning new projects committees etc. However, as stated earlier, there are no financial provisions in Germany for national committees.

From France, the responds was in the affirmative about rules for starting new national committees. The answers from France indicated that there are normally contracts signed between AFNOR and the company or institution etc. requesting for the standardization work. Financing is taken care of by whoever requests for the standardization work.

The questionnaire response from the Netherlands reported the presence of set principles for starting new national committees, which include the availability of enough participants who will finance the costs of running the secretariats.

In Finland, there are already laid down principles for starting new national committees, among these rules are transparency and involvement of all interested parties. However, there are no financial provisions for starting or organizing national secretariat work.

Question 6: *Are there rules from national standards body for organizing work in national committees or reference groups, e.g. voting procedures, memberships etc.?*

Answers to question 6 showed that, in Germany, there are laid down rules by the national standards body for organizing work in national committees and reference groups. Consensus is preferred in national standardization work. The principle of majority vote applies; in this case not experts but all interested parties, e.g. manufacturers have one vote and the same is for representatives of users or authorities. In the Netherlands, there exist rules in the national standards body, NEN for organizing work in national committees or reference groups. There are also some basic rules in national standards body SFS in Finland for organizing work in national committees or reference groups. There was however no comment about rule form national standards body for organizing work in national committees or reference groups from France.

Question 7: *Is the national member body a member of the reference groups?*

Question 8: *Are there limitations for participating in the reference groups, e.g. for members and non-members of federations, institutions etc.?*

Question 7 and 8 inquired about activities in reference groups in the various countries. The received answers showed that in Germany, the national member body is a member of the reference groups and there are no limitations for participating work in the reference groups.

In the Netherlands, NEN takes care of all reference group work; however, there are limitations in the participation. Only members who pay can participate in reference groups.

The response from France did not indicate whether the national member body a member of the reference groups. The response from France indicated that there are limitations for some participating parties, but no limitations for users in participating in reference groups.

In Finland the national body is not a member of the reference groups, however there are no limitations for participating in reference groups.

Question 9: *Are there the following payments or dues involved in Agricultural machinery standardization in your country?*

Payments for participating in national, additional payments in participating in international meetings as a national delegate, additional payments for being nominated as a CEN/TC/WG-expert, payments in receiving drafts (e.g. ISO, CEN or national drafts) for comments as a national committee member or as a non-member.

About the financing situations in the various countries, the results indicated that in Germany there are no payments in participating in ISO meetings as a national delegate or any additional payments as a nominated expert participating in CEN. Furthermore, response

from Germany indicated that members of committees receive free copies of national and international drafts whilst non-members have to buy the drafts.

In the Netherlands the results indicated that there are no payments in participating in ISO meetings as a national delegate or also any additional payments as a nominated expert participating in CEN. In addition, copies of national and international drafts are provided for free.

In France, there are no payments in participating in ISO meetings as a national delegate or also any other payments when nominated as participating expert in CEN. However, non-members have to buy national and international drafts whilst members receive copies of drafts for free. The answers from France went on further to state that in agricultural and forestry machinery standardization; those who do not participate in standardization in this field do not get the option of having information.

In Finland, there are no payments in participating in ISO meetings as a national delegate or any additional payments as a nominated expert participating in CEN. Furthermore, copies of national and international drafts are provided for free.

Question 10: *How will you describe the activity and participation interest in the members involved in standardization of Agricultural machinery in your country?*

The answers from Germany and the Netherlands indicated that the participation in those countries in standardization of Agricultural machinery was high. No information was received from France on this issue. In Finland, there is low participation in standardization in the agricultural and forestry machinery sector, however the participation level is increasing.

Question 11: *Have you evaluated in you country, the benefits obtained from agricultural machinery standardization?*

In Germany no evaluation has been done on the benefits of agricultural machinery standardization. The national standardization body however conducted a study in the year 2000 about the benefits of standardization in general and the results showed that standardization creates a benefit of about 16 milliard euros. In the Netherlands the benefits obtained from agricultural machinery standardization have been evaluated according to the received answers. The questionnaire from France did not give any response to the question about evaluating the benefits of agricultural machinery standardization in their country. Finland is conducting this research to evaluate the benefits obtained from agricultural machinery standardization.

Question 12: *What is your view about the organization of Agricultural Machinery standardization in your country? If there are drawbacks in the system of standardization, what procedures will make them better?*

Answers from the individual countries pointed out various problems in agricultural machinery standardization work. In Germany, there are resources lacking in some areas. The response from Germany also indicated that the working procedures in standardization are becoming more and more bureaucratic, the rules are permanently changing. Direct application of ISO standards in the EU was also given in response to question 12.

In the Netherlands, NEN tries to combat problems in agricultural machinery standardization work by using ISO 9001; *Quality management systems - Requirements*. There were no comments about the problems in agricultural machinery standardization work from France. Finland is conducting this research to identify the problems in agricultural machinery standardization in the country.

Question 12: *Can you list or enumerate some of the benefits that may be obtained by standardization of agricultural machinery.*

The results given from the responding countries are as follows:

> *"Standardization of interface is the pre-condition for the techniques used today (tractor implement combinations) and to support the application / implementation of new technologies"*
>
> *"Definition of 'state of art' by experts' for the use by manufacturers, authorities and farmers"*
>
> *"International harmonization (more safety for users and environment, fair competition for farmers and manufacturers"*
>
> *"Reducing costs"*
>
> *"Discussion about problems with other firms in national committees"*
>
> *"Discussion about problems with other firms in CEN and ISO"*

6 Discussion

The following is a brief discussion about the results of the questionnaires received by MTT Agricultural Engineering Research.

The analysis showed that most companies and other organizations rely on standards in Finnish published by the Finnish Standards Association SFS. This also indicates that standards that are translated into Finnish are very important to the agricultural and forestry machinery industry. At the moment there is a good patronization in the electronic SFS e-catalogue (SFS e-käsikirja); a CD-rom collection of standards for tractors, agricultural and forestry machinery standards. Information from SFS for the year 2003 showed that between 01.01.2003 - 10.12.2003 there were a total sale of 171 copies of standards in the group 65.060; agricultural and forestry machinery standards of which 10 were electronic versions.

Some companies and other organizations have standing orders for standards from the Finnish Standards Association SFS. The companies and organizations therefore get regular information and newly published standards. However, the usage of agricultural and forestry machinery standards in Finland could be better than at present. In some extreme cases related to standards usage, there are even deviations from standards, examples include the three-point linkage dimensions and the position of the power take-off shaft of the tractor. The participation in the preparation and usage of safety standards could also be better, as issues related to safety are becoming more and more important. More publicity about standards both to companies and users of agricultural machines could increase the level of participation in standardization in the field.

There is currently an increasing participation in international standardization work e.g. in ISO sub-committees. The participation level is very high especially when the sub-committee secretariat work is done in Finland; however, some companies still participate in meetings outside Finland. Among the agricultural and forestry machinery manufacturers, some companies participate regularly and actively, and give their comments during standards preparation. There is room for improvement in this area so that the views of the companies can rightly be reflected in prepared standards. The number of national committee meetings could also be more than presently. This will help to increase the activity in standardization in the field of agricultural and forestry machines. About companies' participation in standardization, the number of companies who only observe or follow standardization work is about three times the numbers that participate actively in standards committees. The ideal is rather to have higher active participation and lower number of followers. This means that there is room for improvement in participation in agricultural and forestry machinery standardization. There is also the need for more active participation in giving comments on SFS, ISO and CEN standards proposals during standards preparation works.

In order of participation interest, companies participate actively in standards related to dimensions followed by standards related to safety. However, environmental standards related to agricultural and forestry machines have lower participation. There is the need to increase the awareness of the importance of environmental and safety standards, which some companies see as being in a different level in standardization.

The companies and organizations pointed out that language and therefore the understanding of the technical contents of standards was a typical problem for most of them. It will benefit a lot of companies if there is a translation of proposed standards during the inquiry stage rather than only when the standards are published as done currently. This will eliminate the problem caused by the language barrier and might yield a higher interest and comments from the companies and therefore active participation by all concerned parties.

Currently there is a wide use of Finnish national standards being it from ISO or CEN (SFS, SFS-EN, SFS-EN ISO) or other probably because they are translated into Finnish as stated earlier. However, the national standards from other countries are also important to agricultural and forestry manufacturing companies. For example there is the wide use of GOST (Russian Federation for Standardization and Metrology) standards, when companies export their products to Russia. From the results of the questionnaire, it was clear that there is high use and participation in international agricultural and forestry machinery standards related to protective structures and dimensions in Finland.

Majority of the companies and organizations that responded to the questionnaire indicated that standards are expensive, especially international standards. Most standards organizations finance standardization work through the sale of standards and for that matter the price of standards in this case varies a lot. Information from the SFS standards sales services pointed out that SFS has price control at the moment only on national and European standards published as SFS standards. The prices of other international standards like ISO and other national standards are determined from the source and SFS only adds service costs and profit percent. At the moment it is also possible to buy standards directly in electronic form from international sources and SFS has no control over the pricing system in this case. In this sense, MTT Agricultural Engineering Research cannot affect the prices of standards.

In Finland there are a number of sources to obtain information about standards and standardization. Some of the sources are from the internet pages of the Finnish Standards Association SFS. The library of SFS has also a complete collection and database for standards and the SFS publication SFS-tiedotus. The SFS-tiedotus (SFS-report) appears six times per year, has altogether 3 200 issues (November 2003) and has over 10 000 readers. SFS-tiedotus gives a lot of information about issues related to standards, about new and standards to be published in the future.

MTT Agricultural Engineering Research's information leaflet "Eurotiedote" is also good source of information concerning agricultural and forestry machinery standardization and

standards in addition to information on the internet from the MTT pages (http://www.mtt.fi/tutkimus/teknologia/eurotie2.pdf). There is also the possibility for enquires about agricultural and forestry machinery standards and standardization through telephone or e-mails. There was a noteworthy suggestion from questionnaire answers about offering payable extensive advisory service on standards and directives related to agricultural and forestry machines by the Agricultural Engineering Research, MTT Vakola. Although MTT Vakola has help and advice through telephone calls e-mails and personal contacts etc., this suggestion is worth noting to increase interaction between the parties involved in agricultural and forestry machinery standardization.

There was also a suggestion for making available the table of contents of standards in Finnish free of charge for instance on the internet to provide manufactures and users with brief information about standards and which standards to buy. This will also provide good information to manufacturers about the content of standards in the light of the huge collection of standards. Now the scope of standards is available from SFS free of charge. Companies, who have problems with standards in Finland, should endeavor to be in contact with MTT Agricultural Engineering Research (Vakola) in cooperation with the Finnish Standards Association SFS, which is responsible for standardization in the area of agricultural and forestry machines.

A large number of the respondents of the questionnaire indicated that standardization is slow. On one had, proper standardization takes place through consensus representative to all parties concerned, and brings solutions and unification of principles. This means that standardization cannot take place overnight. But on the other hand, it must be appropriate in terms of technological advancement and up to date. Technological advancement however is taking place at a high rate, which standardization must keep up to. There has been a lot of effort at reducing the time involved in standardization. ISO for example has listed shorter time frames for development of international standards. There is also a new time scale in CEN for preparing standards at the regional level. Unfortunately, very often, it is rather the formal rules and processes that increase standards development times. It will also help a lot to reduce the trend of standardization not meeting technological advancement if companies research and development teams will team up with standardization bodies and other educational and research institutions.

Majority of the companies who responded to the questionnaire agreed that standards affect their products. This means that the incorporation of standards at the early stages in product development will yield benefiting results to the agricultural and forestry manufacturing companies. However, extra costs will be incurred if products are made ready before they are adapted to relevant standards, which may happen when there is a big difference between the countries where the manufacturing takes place and the countries where products are exported. Unification of standards like in CEN will help reduce differences in standards within the European region.

Analyzed results of the questionnaire showed that almost all the responding companies agree that safety standards clarify safety requirements of products. All companies who responded to the questionnaire also agreed that safety standards reduce accidents when machines and devices are used. Eighty-six percent (86 %) are of the opinion that safety standards help reduce accidents in machinery manufacture or production. It is very clear from the questionnaire that safety is an important factor considered by the agricultural and forestry manufacturers in Finland.

With regards to the environment, 89 % of the respondents are of the opinion that standards help in protecting the environment. However, some of the responding companies indicated that although the minimum requirements of environmental standards are met, they are generally difficult to follow.

It was established through the questionnaire that standards when adopted systematically place companies on the benefiting end. Standardization was also acknowledged by the companies to aid cooperation between them. A high number of the responding companies (77 %) also stated that standardization to some extent causes positive competition on the agricultural and forestry machinery market. Standards were also agreed to strengthen the competitive ability of the agricultural and forestry machinery manufacturer.

The responding companies agreed that the use of standards increase customer confidence in their products. It is very clear on the part of manufacturers that the use of standards has an effect on the performance of the company. One company gave the comment that when standards are used; it indicates that products have high quality and they benefit customers in terms of compatibility between equipment. Another respondent stated that “it shows good level of business activity to the customer”.

Form the results of the questionnaire, it was realized that generally, there is very low participation in standardization by smaller (SME) agricultural and forestry manufacturing companies in Finland. A number of the companies stated that they do not have the necessary resources for obtaining information about standards and nearly all the companies were small sized companies. A clear majority (nearly 90 % have less than 5 workers) of the agricultural and forestry machinery manufacturing companies are small companies. If these large numbers of small companies do not take active part in standardization in the field, the few large companies will have their voices dominating the standardization. These will be a disadvantage to the small sized companies that are struggling to grow or survive. In light of the small resources of the smaller companies, they should take active part in standardization by sending their necessary comments, voicing out and channeling their problems with standards to the standardization authorities so that all their interests are taken into account during standardization.

From companies’ response to the questionnaire over 92 % accepted the present standardization system in Finland. From the experience of the agricultural and forestry machinery standardizers in Finland, the present system enhances contact between standards writing

body (in the area of research and testing), farmers, companies' education and other research institutions. Nearly all the responding companies (98 %) accept the present system for financing standardization in Finland. The main aim of standardization in Finland is to serve everyone whether payable or not. The present system of standardization was acknowledged to be working smoothly such that there are no proposals for a change at the moment.

7 Conclusions

From the results of this study it is very clear that the use of standards has an effect on the performance of the company. On the part of manufacturers, it was also agreed that the use of standards help reduce accidents during machinery manufacture or production and increase customer confidence in their products. The benefits of standardization are notably considerable both on the national domestic market and in international export trade. Standards, when used in the right way and effectively integrated into companies operations, may bring rewarding benefits to the agricultural and forestry manufacturer. The use of standards may diminish excess costs, boost a companies productivity, provides consumer safety and satisfaction, reduce development cost and increase product quality. Because of the essential part standards play in our society today, standardization work will continuously be needed in the future.

Standards are being used more in legislations and companies cannot afford to stay outside standardization. The vast advancement in technology and the ever-growing need for compatibility and communication between implements and machinery has led to standardization playing an important role in assuring compatibility between products. Indeed companies and all other stakeholders must endeavor to play an active role in standardization for the benefit of the whole society or accept standardization established without considerations of their interests. In order to gain the full benefits of standardization, companies should try to integrate standardization into their system of operation and involve themselves as much as to obtain the maximum benefits it provides for the industry.

It has been established from this research by the majority that the present way of organizing standardization and for that matter the agricultural and forestry standardization work in *MTT Vakola* is regarded to be effective. However, the system must be developed critically to maximize efficiencies. The present system of agricultural and forestry machinery standardization offers the benefits of close contact between farmers, manufacturing companies and government. In addition, the system offers cooperation between the parties involved in standardization such as test institutions, research and education within the agricultural and forestry machinery sector.

The present system of financing in agricultural and forestry machinery standardization was also acknowledged to be very convenient and system yields good results. Most of the small and medium sized companies (SME's) complained of their inability to take part in standardization as due to lack of resources. If participation in standardization becomes payable, the already low participation of the SME's may even worsen.

In terms of standardization activity in the sector, SME's must be encouraged to take active part in standardization work. Furthermore, the participation of SME's in standardization will promote cooperation and the flow of information for larger companies to them. In this way, innovative abilities of the SME's will be enhanced. More efforts should also be invested into publicizing standardization work among stakeholders in magazines like Koneviesti and the SFS-tiedote etc. Regular advisory services, seminars and extensive marketing of the importance and significance of standardization will help to stir up the interest among the members who are passive in agricultural and forestry sector. Opportunities should be seized to increase the publicity of agricultural and forestry machinery standardization at the various large and small exhibitions held in Finland. Furthermore, there should be more publicity about the services that are offered to the industry both free and payable to the parties in standardization, for them to know where to turn to, and whom to consult with, for advice and help in standardization in the field of agriculture and forestry.

In order to help accelerate the overall standardization process, the structure of the standardization in Finland and for that matter other countries in Europe, should be streamlined such that there is a reduction of the time involved in formulating, commenting and adopting of agricultural and forestry machinery standards. Even if there is the risk of the final standards being so different from the draft standards, effort should be made translate standards at the inquiry stages. There should be more translation of international standards proposals that are in foreign languages to enable ease of understanding and overcome the language barrier. This will enhance the interests of the various parties in giving comments during the standards formulating process.

A clearer description about the content of agricultural and forestry machinery standards will help users know what standards are of relevance to them. Although a list of contents gives an idea about what a standard consists of, a brief summary will give a thorough idea about a standard. SFS has addressed this problem by including the scope of standards, which are available for free both from their shop and on the internet.

8 Summary

The objective of the study is to clarify the benefits of standardization in the area of agricultural and forestry machinery through a literature review and questionnaire enquiries in Finland and some European countries.

Standards are documented consensus agreements containing safety or technical specifications or other precise criteria to be used consistently as rules, guidelines, or definitions of characteristics for materials, products, processes and services. In many cases, they provide uniformity, which allows worldwide acceptance and application of a product or material. The aim is to facilitate trade, exchange and technology transfer, remove technical barriers to trade, leading to new markets and economic growth for the industry (SFS 2002a).

The International Organization for Standardization ISO is a worldwide federation of national standards bodies from more than 146 countries (ISO 2002), one from each country. At the regional level, standardization work in Europe is conducted by the European Committee for Standardization (CEN). Finland has from the onset since the 22nd of March 1961 (Kaartama 1984). The Finnish Standards Association SFS serves as the central standardization organization in Finland. SFS is an independent non-profit making organization. SFS works in cooperation with trade federations and industries, research institutes, trade unions, consumer organizations as well as governmental and local authorities. Preparation of standards is care of by cooperation with the 15 standards writing bodies. All European standards are confirmed in Finland as SFS standards, and existing national standards conflicting with them are withdrawn (SFS 2002a, b & c).

There has been little research on the overall benefits of standards to the society, but what there is, is very supportive of the view that standards provide major benefits to the society (CEN 2002). In many instances standards efficiently take care of established technology and this allows resources to be focused on innovation. In this way, standardization helps to increase competition and for that matter lower output and sales costs, benefiting the economy as whole (DIN 2000). Standardization is a key part of the microeconomic infrastructure, thus, it can enable innovation or act as a barrier to cause undesirable outcomes (Swann 2000). Standards are of great use to most countries in drawing up legislation, and are often referenced in legal cases for instance amongst the EU member states. (Temple & Williams 2002). Standards aid in eliminating unnecessary functions of the company and in this way free resources that can be channeled to more productive work (Pesonen 1984). Standardization can lead to lower transaction costs in the economy as a whole, as well as to savings for individual business. Participation in the standardization process increases awareness of product safety, reduce the economic risk and costs in R&D activities (DIN 2000).

The agricultural and forestry machinery manufacturers sector is made up of a large number of small and medium-sized companies. Towards the end of the 1990's there were more than 700 places of business (working places) in the agricultural and forestry machinery

manufacturing sector according to Statistic Finland. Nearly 90 % of the manufacturing places of business have less than five working personnel (Manni & Riipinen, 2002). The export of agricultural and forestry machines from Finland has been growing since 1994.

The analysis of the questionnaire in Finland showed that most companies and other organizations rely on published standards that are translated into finnish. There is currently an increasing participation in international standardization work in ISO sub-committees. Among the agricultural and forestry machinery manufacturers, some companies participate regularly and actively, and give their comments during standards preparation. There is room for improvement in this area so that the views of the companies can rightly be reflected in prepared standards.

The companies and organizations that responded to the Finnish questionnaire pointed out that language and therefore the understanding of the technical contents of standards was a typical problem for most of them. It will benefit a lot of companies if there is translation of proposed standards during the inquiry stage rather than after the standards are published as done currently. A brief description about the content of agricultural and forestry machinery standards will help users know what standards are of relevance to them.

All the respondents agreed that safety standards clarify safety requirements of products and safety standards reduce accidents when machines and devices are used. The present way of organizing and financing agricultural and forestry machinery standardization in Finland was also acknowledged by almost all the responding companies to be very convenient and yield good results.

With regards to the environment, 89 % of the respondents are of the opinion that standards help in protecting the environment. However, some of the responding companies indicated that although the minimum requirements of environmental standards are met, they are generally difficult to follow. Standardization was also acknowledged by the companies to aid cooperation between them. A high number of the responding companies (77 %) also stated that standardization to some extent causes positive competition on the agricultural and forestry machinery market. Standards were also agreed to strengthen the competitive ability of the agricultural and forestry machinery manufacturer. The responding companies agreed that the use of standards increase customer confidence in their products. It is very clear on the part of manufacturers that the use of standards has an effect on the performance of the company.

Majority of the companies and organizations that responded to the questionnaire indicated that standards are expensive, especially international standards. The information from SFS revealed that prices of international standards like ISO and other national standards are determined from the source and SFS only adds service costs and profit percent. On the other hand, MTT Agricultural Engineering Research cannot affect the prices of standards. Form the results of the questionnaire, it was realized that generally, there is very low participation in standardization by smaller (SME) agricultural and forestry manufacturing

companies in Finland. A number of the companies stated that they do not have the necessary resources for obtaining information about standards and nearly all the companies were small sized companies. In terms of standardization activity in the sector, SME's must be encouraged to take active part in standardization work. Furthermore, the participation of SME's in standardization will promote cooperation and the flow of information for larger companies to them. In this way, innovative abilities of the SME's will be enhanced.

MTT Agricultural Engineering Research's information leaflet "*Eurotiedote*" is also a good source of information concerning agricultural and forestry machinery standardization and standards in addition to information on the internet from the MTT pages (http://www.mtt.fi/tutkimus/teknologia/eurotie2.pdf). There is also the possibility for enquires about agricultural and forestry machinery standards and standardization from MTT Vakola through telephone calls or e-mails.

In order to help accelerate the overall standardization process, the structure of the standardization in Finland and for that matter other countries in Europe, should be further streamlined such that there is maximization of the time involved in formulating, commenting and adopting of agricultural and forestry machinery standards.

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10 Appendices

Appendix 1

Abbreviations

AFNOR - Association Francaise de normalisation (National Body of France)

AG - CEN General Assembly

ANSI - American National Standards Institute (National Body of the United States)

APEC - Asian Pacific Economic Cooperation group

ASB - Associated Standardization Body

BSI, BS - British Standards Institute (National Body of the United Kingdom)

BT - Technical Board

CD - Committee Draft

CDV - Committee Draft for Vote

CEC - Commission of the European Communities

CE Mark - Harmonized European mark for indicating conformance to relevant EU Directives

CEN - Comité Européen Normalisation (European Committee for Standardization)

CENELEC - Comité Européen Normalisation Electrotechnique (European Committee for Electro-technical Standardization)

COPOLCO - Committee on Consumer Policy

CR - (CEN report) - CENin raportti

CTR - Common Technical Regulation

DAM - Draft Amendment

DIN - Deutches Institut fur Normung (National Body of the Germany)

DIS - Draft International Standard

EC - European Commission

ECE - Economic Commission for Europe

EEA - European Economic Area

EFTA - European Free Trade Association

EN - European Standard (i.e., European Norm)

ENV - European Pre-standard

ER - Essential Requirements

EOTC - European Organization for Testing and Certification

ETSI - European Telecommunications Standards Institute

EU - European Union

FDIS - Final Draft International Standard

FTA - Free Trade Agreement

GA - ISO or IEC General Assembly

GATT - General Agreement on Tariffs and Trade (refer to WTO)

GDP – Gross Domestic Product

GNP – Gross National Product

GOST R - Committee of the Russian Federation for Standardization, Metrology and Certification

HD - Harmonization Document

hEN - Harmonized European Standard

IEC - International Electrotechnical Commission

IS - International Standard

ISO - International Organization for Standardization

ITU - International Telecommunications Union

JIS - Japanese Industrial Standards Committee (JISC)

MATA - Abbreviation used in the Finnish language for the farmers' employment accident (workers' compensation) insurance system

MELA - Farmers Social Insurance Institution

MTT - Agrifood Research Finland

MTT Vakola – Agricultural Engineering Research, Finland

NB - National Body

NC - National Committee

NEN - Nederlands Normalisatie-Instituut , National Body of the Netherlands

NSB - National Standards Body

NSO - National standards Organization

OECD - Organisation for Economic Cooperation and Development

OH&S - Occupational Health and Safety Management

OJ - Official Journal

prEN - Preliminary European Standard

prENV - Preliminary European Pre-standard

pr ETS - Preliminary European Telecommunications Standard

pr HD - Preliminary Harmonization Document

pr I-ETS - Preliminary Interim European Telecommunications Standard

RD - Reference Document

ROPS – Rollover protective structure

SC - Subcommittee

SFS - Finnish Standards Association SFS

SI - International System of Units

SIS - Swedish Standards Institute; Standardiseringen i Sverige

SWB – Standards Writing Body *(TAY – toimialayhteisö)*

TAG - Technical Advisory Group

TBT - Technical Barriers to Trade

TC - Technical Committee

TS - Technical Specification

TMB - ISO Technical Management Board

UN - United Nations

UNI - Ente Nazionale Italiano di Unificazione (National Body of Italy)

VDMA - German Engineering Federation (standards writing body, SWB)

VA - Vienna Agreement

VAKOLA – Agricultural Engineering Research, Finland

WD - Working Draft

WG - Working Group

WI - Work Item

WTO - World Trade Organization

Appendix 2

2003-04-01

MTT Agricultural Engineering Research Vakola

QUESTIONNAIRE ON STANDARDIZATION OF AGRICULTURE AND FORESTRY MACHINES

Background information

Name: Position in the company:

Name of the company:

Turnover of the company: Number of people of the company:

1. What standards are used in your company?

☐ Standards published by SFS (SFS, SFS-EN, SFS-ISO)
☐ International standards (e.g. ISO)
☐ Company's own standards
☐ National standards of other countries (e.g. BSI, DIN, SIS etc.)
☐ Others, what?

_____

2. How many standards do you buy every year?

☐ 1 – 5 ☐ 6 – 10 ☐ over 10 ☐ Non

3. In which form do you buy standards?

☐ Manual ☐ Cd-rom ☐ Paper ☐ Pdf-form ☐ Other _____

4. How do you obtain standards?

☐ SFS-e trade ☐ E-mail ☐ Telephone/fax ☐ Other _____

5. How does your company get information about standards?

	Now	In the future
We participate in standardization work at national level.	☐	☐
We participate in standardization work at international level.	☐	☐
We follow the development of standards actively and we try to adopt new standards as soon as possible.	☐	☐
We get the information about standards from service companies (e.g. subcontracting, consultation).	☐	☐
We get information about standards from MTT/Vakola	☐	☐
We get information about standards only when customers demand them	☐	☐
In other ways, how?	☐	☐

6. What kinds of standards or regulations do you think will be crucial in the coming 10 years? Number 1,2,3 etc. in the order of importance.

_____ National standards (SFS, DIN, SIS)
_____ International standards (ISO)
_____ European standards EN
_____ Companies own standards
_____ Others, what?

7. How does your company participate in standardization work at the moment??

	We participate in the committee working level	We give comments	Only follow	We participate in other ways	We do not participate
ISO (international standardization organization)	☐	☐	☐	☐	☐
CEN (European standardization organization)	☐	☐	☐	☐	☐
SFS branch communities	☐	☐	☐	☐	☐

8. Estimate whether standards make business more difficult or they bring new innovative possibilities.

	Factor which makes business more difficult	Bring new possibilities	How:
ISO	☐	☐	_____
CEN	☐	☐	_____
SFS (National standards)	☐	☐	_____

9. In which areas does your company participate in standardization work at the moment?
Furthermore, state whether standard affects business or brings new innovative possibilities.

	We participate	Only follow	We do not participate	Makes business more difficult	Bring new possibilities
Basic standards e.g. example screws, nuts, drawings, materials	☐	☐	☐	☐	☐
Safety standards which are related to a agriculture and forestry machines	☐	☐	☐	☐	☐
Environmental standards which are related to agriculture and forestry machines	☐	☐	☐	☐	☐
Dimensioning standards and structural standards which are related to a agriculture and forestry machines	☐	☐	☐	☐	☐
Others, what?	☐	☐	☐	☐	☐
Quality standards which are related to production	☐	☐	☐	☐	☐
Environmental standards which are related to production	☐	☐	☐	☐	☐
Safety standards which are related to production	☐	☐	☐	☐	☐
Others, what?	☐	☐	☐	☐	☐

10. State your opinion about the following from your company's experience.

Standards are expensive.
☐ Yes ☐ No ☐ I cannot tell If yes, the price should be: _____

It is laborious to get standards
☐ Yes ☐ No ☐ I cannot tell If yes, how would the standards be got more easily? _____

It is difficult to get information about standards.
☐ Yes ☐ No ☐ I cannot tell If yes, why? _____

Our company does not have enough information about standards.
☐ Yes ☐ No ☐ I cannot tell If yes, why? _____

Modifying of our products according international standard bring extra costs. You can choose several alternatives.
☐ Yes ☐ No ☐ We do not modify our products to meet international standards ☐ We do not export our products

If yes, how much and what kind of costs?

_____

Standardization work is slow.
☐ Yes ☐ No ☐ I cannot tell If yes, how would you accelerate and improve standardization work?

_____

11. What in your opinion are the benefits of standardization to your company? (Thick where appropriate, possibly giving reasons for your answer and give figures where relevant)

	Totally agree	Partly agree	Partly disagree	Totally disagree	I Cannot tell	Give reasons for your answer
The use of standards increase customer's confidence	☐	☐	☐	☐	☐	
The use of standards reduce legal claims	☐	☐	☐	☐	☐	
Standards help in environmental protection	☐	☐	☐	☐	☐	
Safety standards reduce accidents when machines and devices are used	☐	☐	☐	☐	☐	
Safety standards reduce accidents in machinery manufacture	☐	☐	☐	☐	☐	
Level of the standardization corresponds to technological developments	☐	☐	☐	☐	☐	
Standards help increase our company's import (e.g. components import)	☐	☐	☐	☐	☐	
Standards help increase our company's export	☐	☐	☐	☐	☐	
Standards reduce production costs	☐	☐	☐	☐	☐	
Standards reduce the prices of products	☐	☐	☐	☐	☐	
The standards affect the products of our company	☐	☐	☐	☐	☐	
Modifying products to be in accordance with the international standards increase the turnover of our company	☐	☐	☐	☐	☐	
Standards benefit competitors more our company	☐	☐	☐	☐	☐	
Standardization strengthens the competitive ability of our company	☐	☐	☐	☐	☐	
Standardization helps to create cooperation between companies	☐	☐	☐	☐	☐	
Standardization causes positive competition on the market	☐	☐	☐	☐	☐	
Safety standards clarify safety requirements of products	☐	☐	☐	☐	☐	

10. What are your biggest problems when utilizing standards?
Number 1,2,3 etc. in the order of importance.

____ Language	____ Information about standards
____ Technical contents	____ obtaining standards
____ Costs	____ Other: _____

13. How should agriculture and forestry machinery standardization of be organized in the future?

☐ The standards writing bodies arrange standardization work (the present system)

☐ SFS totally takes care of standardization

☐ Other, what?

_____
_____
_____
_____

14. Will you be willing to participate in the preparatory work of standards if the operation becomes chargeable?

☐ Payment for participation, in which one can participate in national committees and in international meetings.

☐ The present system is better. The preparatory work is financed from the budget of the country.

☐ Other, what?

_____
_____
_____
_____

15. What other factors in your opinion do affect standards and standardization work in addition to the above questions? You my give any other comments you have.

_____
_____
_____
_____
_____
_____
_____
_____

16. Proposals and wishes about MTT/Vakola's standardization work etc.:

_____
_____
_____
_____
_____
_____
_____

17. May we follow your answers with a telephone interview?

☐ Yes ☐ No

THANK YOU FOR YOUR ANSWERS!

APPENDIX 3

2003-04-01

MTT

Maatalousteknologian tutkimus (Vakola)

KYSELY MAA- JA METSÄTALOUSKONEIDEN STANDARDISOINNISTA

Taustatiedot

Vastaajan nimi | Asema yrityksessä

Yrityksen nimi

Yrityksen liikevaihto | Yrityksen henkilömäärä

1. Mitä standardeja yrityksessä käytetään?

☐ SFS:n julkaisemia standardeja (SFS, SFS-EN, SFS-ISO) ☐ Kansainvälisiä standardeja (esim. ISO)
☐ Yrityksen omia standardeja ☐ Muiden maiden kansallisia standardeja
☐ Muita, mitä? (esim. BSI, DIN, SIS, jne.)
_____

2. Kuinka monta standardia ostatte vuosittain?

☐ 1 – 5 ☐ 6 – 10 ☐ yli 10 ☐ ei yhtään

3. Missä muodossa ostatte standardit?

☐ Käsikirja ☐ Cd-rom ☐ Paperi ☐ Pdf-tiedosto ☐ Muu _____

4. Kuinka hankitte standardit?

☐ SFS-e kauppa ☐ Sähköposti ☐ Puhelin/fax ☐ Muu _____

5. Miten yrityksesi hankkii tietoa standardeista?

	Nyt	Tulevaisuudessa
Osallistumme standardisointityöhön kansallisella tasolla.	☐	☐
Osallistumme standardisointityöhön kansainvälisellä tasolla.	☐	☐
Seuraamme aktiivisesti standardien kehitystä ja pyrimme omaksumaan uudet standardit mahdollisimman nopeasti.	☐	☐
Hankimme tiedot standardeista palveluyritykseltä (esim. alihankinta, konsultointi).	☐	☐
Hankimme tietoa standardeista MTT/Vakolasta.	☐	☐
Hankimme tietoa standardeista vasta, kun asiakkaat vaativat.	☐	☐
Muulla tavoin, miten?	☐	☐

6. Arvioi, minkä tyyppiset standardit tai määräykset nousevat keskeisiksi yrityksessänne 10 vuoden kuluessa? Numeroi tärkeysjärjestyksessä 1,2,3 jne.

_____ Kansalliset standardit (SFS, DIN, SIS) _____ Kansainväliset standardit (ISO)
_____ Eurooppalaiset-EN standardit _____ Yritysten omat standardit
_____ Muut, mitkä?

7. Miten yrityksesi osallistuu tällä hetkellä standardisointityöhön?

	Osallistumme komitea-työskentelyyn	Annamme lausuntoja	Vain seuraamme	Osallistumme muulla tavoin	Emme osallistu
ISO (kansainvälinen standardisointijärjestö)	☐	☐	☐	☐	☐
CEN (eurooppalainen standardisointijärjestö)	☐	☐	☐	☐	☐
SFS toimialayhteisöt	☐	☐	☐	☐	☐

8. Arvioi, vaikeuttavatko standardit liiketoimintaa vai tuovatko ne uusia mahdollisuuksia.

	Liiketoimintaa vaikeuttava tekijä	Tuo uusia mahdollisuuksia	Miten:
ISO	☐	☐	_____
CEN	☐	☐	_____
SFS (Kansalliset standardit)	☐	☐	_____

9. Millä alueilla yrityksesi osallistuu tällä hetkellä standardisointityöhön? Arvioi lisäksi, miten standardit vaikuttavat liiketoimintaan ja tuovatko ne uusia innovaatiomahdollisuuksia.

	Osallistumme	Vain seuraamme	Emme osallistu	Liiketoimintaa vaikeuttava tekijä	Tuo uusia mahdolli-suuksia
Perusstandardit, esim. ruuvit, mutterit, piirustukset, materiaalit	☐	☐	☐	☐	☐
Maa- ja metsätalouskoneisiin liittyvät turvallisuusstandardit	☐	☐	☐	☐	☐
Maa- ja metsätalouskoneisiin liittyvät ympäristöstandardit	☐	☐	☐	☐	☐
Maa- ja metsätalouskoneisiin liittyvät mitoitus- ja rakenne-standardit	☐	☐	☐	☐	☐
Muut, mitkä?	☐	☐	☐	☐	☐
Tuotantoon liittyvät laatustandardit	☐	☐	☐	☐	☐
Tuotantoon liittyvät ympäristöstandardit	☐	☐	☐	☐	☐
Tuotantoon liittyvät turvallisuusstandardit	☐	☐	☐	☐	☐
Muut, mitkä?	☐	☐	☐	☐	☐

10. Arvioi seuraavia väittämiä yrityksesi näkökulmasta.

Standardit ovat kalliita.
☐ Kyllä ☐ Ei ☐ En osaa sanoa Jos kyllä, hinnan pitäisi olla: _____

Standardien hankkiminen on työlästä.
☐ Kyllä ☐ Ei ☐ En osaa sanoa Jos kyllä, miten standardit hankittaisiin helpommin? _____

Tiedon hankkiminen standardeista on vaikeaa.
☐ Kyllä ☐ Ei ☐ En osaa sanoa Jos kyllä, miksi? _____

Yrityksessämme ei ole riittävästi tietoa standardeista.
☐ Kyllä ☐ Ei ☐ En osaa sanoa Jos kyllä, miksi? _____

Tuotteidemme sopeuttaminen kansainvälisten standardien mukaisiksi aiheuttaa ylimääräisiä kustannuksia. Voit valita useita vaihtoehtoja.
☐ Kyllä ☐ Ei ☐ Emme sopeuta tuotteitamme kansainvälisten standardien mukaisiksi ☐ Emme vie tuotteitamme maasta
Jos kyllä, kuinka paljon ja minkälaisia kustannuksia?

_____

Standardisointityö on hidasta.
☐ Kyllä ☐ Ei ☐ En osaa sanoa Jos kyllä, miten nopeuttaisit ja parantaisit standardisointityötä? _____

11. Seuraavissa väittämissä kartoitetaan standardisoinnin hyötyä yrityksellesi. Vastaa valitsemalla (rasti ruutuun) sopivin vaihtoehto ja mahdollisuuksien mukaan kommentoi myös sanallisesti sekä numeroina.

	Täysin samaa mieltä	Osittain samaa mieltä	Osittain eri mieltä	Täysin eri mieltä	En osaa sanoa	Miksi? Kommenttisi tai summittainen luku
Standardien käyttö lisää asiakkaan luottamusta	☐	☐	☐	☐	☐	
Standardien käyttö vähentää reklamaatioita	☐	☐	☐	☐	☐	
Standardit auttavat ympäristönsuojelussa	☐	☐	☐	☐	☐	
Turvallisuusstandardit vähentävät onnettomuuksia koneita ja laitteita käytettäessä	☐	☐	☐	☐	☐	
Turvallisuusstandardit vähentävät onnettomuuksia koneita ja laitteita valmistettaessa	☐	☐	☐	☐	☐	
Standardisoinnin taso vastaa alan teknologista kehitystä	☐	☐	☐	☐	☐	
Standardit lisäävät yrityksen tuontia (esim. komponenttipuolella)	☐	☐	☐	☐	☐	
Standardit lisäävät yrityksen vientiä	☐	☐	☐	☐	☐	
Standardit vähentävät tuotantokustannuksia	☐	☐	☐	☐	☐	
Standardit laskevat tuotteiden hintoja	☐	☐	☐	☐	☐	
Standardit vaikuttavat yrityksen tulokseen	☐	☐	☐	☐	☐	
Tuotteiden sopeuttaminen kansainvälisten standardien mukaisiksi lisää yrityksen liikevaihtoa	☐	☐	☐	☐	☐	
Standardit hyödyttävät kilpailijoita meitä enemmän	☐	☐	☐	☐	☐	
Standardisointitoiminta vahvistaa yrityksen kilpailukykyä	☐	☐	☐	☐	☐	
Standardisointi auttaa luomaan yhteistyötä yritysten välillä	☐	☐	☐	☐	☐	
Standardisointi aiheuttaa myönteistä kilpailua markkinoilla	☐	☐	☐	☐	☐	
Turvallisuusstandardit selkiyttävät turvallisuusvaatimuksia	☐	☐	☐	☐	☐	

11. Mitkä ovat suurimmat ongelmanne hyödyntäessänne standardeja? Numeroi tärkeysjärjestyksessä 1,2,3 jne.

_____ Kieli
_____ Tekninen sisältö
_____ Kustannukset
_____ Neuvonta standardeista
_____ Standardien hankkiminen
_____ Muu _____

13. Miten maa- ja metsätalouskoneiden standardisointi tulisi järjestää tulevaisuudessa?

☐ Toimialayhteisöt järjestävät standardisointityön (nykyinen järjestelmä)

☐ SFS hoitaa standardisoinnin kokonaan

☐ Muu, mikä?

_____

_____

_____

_____

14. Oletteko halukas osallistumaan standardien valmistelutyöhön, jos toiminta muuttuu maksulliseksi?

☐ Osallistumismaksu, jolla voi osallistua kansallisten komiteoiden työskentelyyn ja kansainvälisiin kokouksiin.

☐ Nykyinen järjestelmä on parempi. Valmistelutyö rahoitetaan valtion budjetista.

☐ Muu mikä?

_____

_____

_____

_____

15. Mitkä muut tekijät vaikuttavat mielestäsi standardeihin ja standardisointityöhön oheisten kysymysten lisäksi?

_____

_____

_____

_____

_____

_____

_____

_____

16. Ehdotuksia ja toivomuksia MTT/Vakolan standardisointi- ym. toimintaa koskien:

_____

_____

_____

_____

_____

17. Saammeko tarkentaa vastauksianne puhelinhaastattelulla?

☐ Kyllä ☐ Ei

Kiitos vastauksistasi!

Appendix 4

Please complete and ***e-mail*** the questionnaire preferably by the ***31st 0f July 2003*** to:

Agricultural Engineering Research, Finland
Vakolantie 55
03400 Vihti
FINLAND
Fax +358 9 224 6210
frederick.teye@mtt.fi

QUESTIONNAIRE ON STANDARDISATION OF AGRICULTURE AND FORESTRY MACHINES

The unit of Agricultural Engineering Research (MTT/Vakola), Finland, functions as a national standards writing body of the Finnish Standards Association SFS in the field of agricultural and forestry machines. MTT/Vakola is also involved in research in various areas in Agricultural Engineering. MTT/Vakola is conducting a research on the benefits of agricultural and forestry machinery standardization. In order to evaluate the benefits of standardization in Finland, a questionnaire was sent to the manufacturers and users of agricultural and forestry machines. To complete the information received nationally, we would like to get also an overview on how agricultural and forestry machinery standardization is organised in some other countries. For this purpose we send this questionnaire which you are kindly invited to complete, and with that you could give answers relating to the situation of agricultural and forestry machinery standardization in your country.

You will be sent a copy of the report when the research is complete. At the beginning of the form, please provide your background information, which will be used as a contact for forwarding the research report to you. Reply to the questions by completing the requested information or marking the relevant boxes with a tick ( ). E-mail the filled questionnaire to frederick.teye@mtt.fi. Below is an explanation of some terms used in the questionnaire.

For further information please contact Frederick.teye@mtt.fi or pekka.olkinuora@mtt.fi.
Thank you for your contribution.

Sincerely yours,

Frederick Teye

Terms:

- *CEN/TC/WG-expert*: An expert of a particular technical field nominated to a particular Working Group (WG).
- *Standards Writing Body*: A body responsible for developing the technical content of a draft or published standard.
- *National Standards Body*: A body that represents the country internationally and assumes the responsibility of organizing standards work in a particular country e.g. SFS, DIN, and AFNOR.
- *National Committees or Reference Group*: A group of individuals working on a particular subject in order to formulate a national comment or position in voting.

1. Name of the person completing the questionnaire……*(Click and type to fill)*...

2. Position in the organization……..

3. Organization:……

4. Address:……

5. E-mail:……

6. Country:……...

1. How and where is standardization of agricultural machinery organised in your country? [The level where national committees / reference groups are organised and comments from the country and votes are formulated]

☐ The national standards body itself ☐ Industry federation ☐ Research institute

☐ Other, (state):

……

2. If agricultural machinery standardization is organised outside the national member body, what is the dividing line in publishing standards?

☐ Standards are prepared by standards writing body but published by the national standards body

☐ Standards are prepared and published by the standards writing body

☐ Standards are prepared and published by the national standards body

☐ Other, (please explain clearly):

……

3. Are there finance provisions for the body preparing the agricultural machinery standards by the national standards body …

a. in running national committees and secretariats?	☐ YES	☐ NO
b. in preparing comments for international work?	☐ YES	☐ NO
c. in translating standards?	☐ YES	☐ NO
d. from sales of standards	☐ YES	☐ NO

e.Other, (state):

……

4. Are there any set principles on how to organise or start a new national committee [for a new field of work]?

☐ YES ☐ NO

If yes, state the criteria / principles in starting the new national committee:

……

5. Briefly explain how a newly started national committees secretariat is financed

……

6. Are there rules from national standards body for organizing work in national committees or reference groups, e.g. voting procedures, memberships etc.?

☐ YES ☐ NO

Further comments:

……

7. Is the national member body a member of the reference groups?

☐ YES ☐ NO

Further comments:

……

8. Are there limitations for participating in the reference groups, e.g. for members and non-members of federations, institutions etc.?

☐ YES ☐ NO

Further comments:

……

9. Are there the following payments or dues involved in Agricultural machinery standardization in your country?

- Payments for participating in national committees ☐ YES ☐ NO
  Comments:
  ……
- Additional payments in participating in international meetings and as a national delegate ☐ YES ☐ NO
  Comments:
  ……
- Additional payments payments in being nominated as a CEN/TC/WG-expert ☐ YES ☐ NO
  Comments:
  ……
- Payments in receiving drafts (e.g. ISO, CEN or national drafts) for comments, as being a national committee member or as a non-member
  ☐ Payment as a member
  ☐ Payment as a non-member
  ☐ No payment
  Comments:
  ……
- Other types of payments, please state:
  ……

10. How will you describe the activity and participation interest in the members involved in standardization of Agricultural machinery in your country?

☐ High ☐ Low ☐ Participation level increasing ☐ Participation level decreasing

11. Have you valued in you country, the benefits obtained from agricultural machinery standardisation?

☐ YES ☐ NO ☐ Will do so in the future

Further comments:

……

12. What is your view about the organization of Agricultural Machinery standardization in your country? If there are drawbacks in the system of standardization, what procedures will make them better?

State briefly:

……

13. Can you list or enumerate some of the benefits that may be obtained by standardization of agricultural machinery.

a.

b.

c.

d.

e.

f.

g.

h.

i.

14. If you have any comments to Agricultural Engineering Research (MTT/Vakola), Finland, please write below

……
……
……
……
……
……
……
……
……
……

Appendix 5

Agricultural and forestry machinery standards published by SFS (ICS no. 65.060. Source: SFS, compiled on 01.11.2004)

STANDARD NUMBER	YEAR	STANDARD NAME (FINNISH)	STANDARD NAME (ENGLISH)
SFS 2940	1990	Koneturvallisuus. Metsätraktorit ja hakkuukoneet 1	Mobile machinery for forestry. Safety
SFS 3953	1977	Maatalous- ja metsätraktorit sekä työkoneet. Ohjekirjojen sisältö	Agricultural and forestry tractors and machines. Contents of operator manuals
SFS 4082	1977	Maataloustraktorit. Ulkopuolinen työkoneiden hydraulisylinteri	Agricultural tractors. Remote control hydraulic cylinders for implements
SFS 4101 ISO 4002-2	1977	Kylvö- ja istutuskoneet. Vantaiden kiekot	Equipment for sowing and planting. Flat disks
SFS 4533	1980	Traktorit ja maatalouskoneet. Kaukosäätölaitteen kiinnityshahlo ja aukot johdoille	Tractors and agricultural machinery. Fixture and apertures for remote control
SFS 4690	1981	Traktorit ja maatalous- ja metsäkoneet. Istuimen referenssipisteen määrittäminen	Tractors and machinery for agriculture and forestry. Determination of seat reference point
SFS 4946	1983	Traktorit ja maatalouskoneet. Jarruhydrauliikan pikaliitin. Mitoitus	Tractors and machinery for agriculture. Braking circuit hydraulic quick coupler. Dimensions
SFS 5086	1987	Metsäkoneiden sanasto. Vintturit (en fi)	Forestry machinery vocabulary. Winches
SFS 5088	1985	Metsäkoneet. Vetolaitteet	Machinery for forestry. Hitches
SFS 5089	1985	Metsäkoneet. Vintturit. Suorituskyky	Machinery for forestry. Winches. Performance
SFS 5090	1985	Metsätraktorit. Puutavarakuormaimet, hallintavipujen järjestys	Forest tractors. Log loaders. Control pattern
SFS 5093	1985	Traktorit ja maatalouskoneet. Hitaasti liikkuvan ajoneuvon kilpi. Kiinnitys	Tractors and machinery for agriculture. Slow moving vehicle emblem. Mounting
SFS 5131	1985	Maatalouskoneiden sanasto. Kasvinsuojelukoneet, välineet ja menetelmät (en fi sv)	Agricultural machines. Terminology. Machinery and methods for crop protection
SFS 5301	1987	Metsäkoneet. Moottorisahat. Kädensijojen mitat	Machinery for forestry. Chain saws. Handles. Dimensions
SFS 5304	1987	Metsäkoneet. Moottorisahat. Tasapaino	Machinery for forestry. Chain saws. Balance
SFS 5307	1987	Metsäkoneet. Moottorisahat. Käsitärinän mittausmenetelmä	Machinery for forestry. Chain saws. Measurement of hand-transmitted vibration
SFS 5337	1987	Ajoneuvot. Moottoriajoneuvojen sisusteiden palo-ominaisuudet	Road vehicles. Burning behaviour of interior materials for motor vehicles
SFS 5482	1988	Maatalouskoneet. Työkoneiden pyörät akseleineen	Machinery for agriculture. Implement wheels with integral hub
SFS 5483	1988	Maataloustraktorit. Etunostolaite	Agricultural tractors. Front-mounted linkage
SFS 5673	1990	Traktorit ja maatalouskoneet. Työkoneiden sähköinen kaukosäätö. Kytkennät	Tractors and machinery for agriculture. Electric remote control for implements. Connections
SFS 5753	1993	Pientraktorit, taajamatraktorit ja etukiinnitteiset työkoneet. Kytkennät	Compact tractors and front-mounted implements. Couplings
SFS-EN 609-1	1999	Maatalous- ja metsäkoneet. Puunhalkaisukoneiden turvallisuus. Osa 1: Kiilahalkaisukoneet	Agricultural and forestry machinery. Safety of log splitters. Part 1: Wedge splitters
SFS-EN 609-2	2000	Maatalous- ja metsäkoneet. Puunhalkaisukoneet. Turvallisuus. Osa 2: Ruuvihalkaisukoneet	Agricultural and forestry machinery. Safety of log splitters. Part 2: Screw splitter
SFS-EN 632:en	1995	Maatalouskoneet. Leikkuupuimurit ja rehusilppurit.	Agricultural machinery. Combine harvesters and forage harvesters. Safety
SFS-EN 690:en	1995	Maatalouskoneet. Lannanlevittimet. Turvallisuus	Agricultural machinery. Manure spreaders. Safety
SFS-EN 704	1999	Maatalouskoneet. Paalaimet. Turvallisuus	Agricultural machinery. Pick-up balers. Safety
SFS-EN 706:en	1997	Maatalouskoneet. Köynnösleikkurit. Turvallisuus	Agricultural machinery. Vine shoot tipping machines. Safety
SFS-EN 707	1999	Maatalouskoneet. Lietevaunut. Turvallisuus	Agricultural machinery. Slurry tankers. Safety
SFS-EN 708 + A1	2000	Maatalouskoneet. Traktorijyrsimet ja heiluriäkeet. Turvallisuus	Agricultural machinery. Soil working machines with powered tools. Safety
SFS-EN 709 + A1	1999	Maatalous- ja metsäkoneet. Kävellen ohjattavat, jyrsimillä tai haranterillä varustetut vetävät traktorit. Turvallisuus	Machinery for agriculture and forestry. Pedestrian controlled tractors with mounted rotary cultivators, motor hoes, motor hoes with drive wheel(s). Safety
SFS-EN 745	1999	Maatalouskoneet. Pyöröniittokoneet ja kelaniittomurskaimet.Turvallisuus	Agricultural machinery. Rotary mowers and flail-mowers. Safety
SFS-EN 774 + A1 + A2 + A3:en	2001	Puutarhakoneet. Käsin kannateltavat moottorilla varustetut pensasaitaleikkurit. Turvallisuus	Garden equipment. Hand-held, integrally powered hedge trimmers. Safety
SFS-EN 786 + A1:en	2001	Puutarhakoneet. Sähkökäyttöiset käsinohjailtavat ja kannateltavat nurmikon ja nurmikon reunojen viimeistelyleikkurit. Mekaaninen turvallisuus	Garden equipment. Electrically powered walk-behind and hand-held lawn trimmers and lawn edge trimmers. Mechanical safety
SFS-EN 836 + A1 + A2:en	2001	Puutarhakoneet. Moottorikäyttöiset ruohonleikkurit. Turvallisuus	Garden equipment. Powered lawnmowers. Safety

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SFS-EN 907	1997	Maatalous- ja metsäkoneet. Kasvinsuojeluruiskut ja nestemäisen lannoitteen levityslaitteet. Turvallisuus	Agricultural and forestry machinery. Sprayers and liquid fertilizer distributors. Safety
SFS-EN 908:en	1999	Maatalous- ja metsäkoneet. Letkukelasadetuskoneet. Turvallisuus	Agricultural and forestry machinery. Reel machines for irrigation. Safety
SFS-EN 909:en	1999	Maatalous- ja metsäkoneet. Säteittäin ja lineaarisesti etenevät sadetuskoneet. Turvallisuus	Agricultural and forestry machinery. Centre pivot and moving lateral types irrigation machines. Safety
SFS-EN 1152:en	1995	Traktorit ja maatalous- ja metsäkoneet. Nivelakselisuojukset. Kulumis- ja lujuustesti	Tractors and machinery for agriculture and forestry. Guards for power take-off (PTO) drive shafts. Wear and strength tests
SFS-EN 1553	2000	Maatalouskoneet. Itsekulkevat, nostolaitekiinnitteiset, puolihinattavat ja hinattavat koneet. Yhteiset turvallisuusvaatimukset	Agricultural machinery. Agricultural self-propelled, mounted, semi-mounted and trailed machines. Common safety requirements
SFS-EN 1853	1999	Maatalouskoneet. Kipattavat perävaunut. Turvallisuus	Agricultural machinery. Trailers with tipping body. Safety
SFS-EN ISO 14982:en	1998	Maatalous- ja metsäkoneet. Sähkömagneettinen yhteensopivuus. Testimenetelmät ja hyväksymisperusteet	Agricultural and forestry machines. Electromagnetic compatibility. Test methods and acceptance criteria (ISO 14982:1998)
SFS-EN 12324-1	1999	Sadetustekniikka. Letkukelasadetuskoneet. Osa 1: Kokoluokat	Irrigation techniques. Reel machine systems. Part 1: Size series
SFS-EN 12324-2:en	2000	Sadetustekniikka. Letkukelasadetuskoneet. Osa 2: Letkukelasadetuskoneiden polyeteeniletkuille asetettavat vaatimukset	Irrigation techniques. Reel machine systems. Part 2: Specifications of polyethylene tubes for reel machines
SFS-EN 12324-3:en	2000	Sadetustekniikka. Letkukelasadetuskoneet. Osa 3: Teknisten tietojen esittäminen	Irrigation techniques. Reel machine systems. Part 3: Presentation of technical characteristics
SFS-EN 12324-4:en	2000	Sadetustekniikka. Letkukelasadetuskoneet. Osa 4: Tarkistusluettelo käyttäjien vaatimuksista	Irrigation techniques. Reel machine systems. Part 4: Check list of users requirements
SFS-EN 12325-1	1999	Sadetustekniikka. Säteittäin ja lineaarisesti etenevät järjestelmät. Osa 1: Teknisten tietojen esittäminen	Irrigation techniques. Centre pivot and moving lateral systems. Part 1: Presentation of the technical characteristics
SFS-EN 12325-2:en	2000	Sadetustekniikka. Säteittäin ja lineaarisesti etenevät sadetuskoneet. Osa 2: Vähimmäissuoritusarvot ja tekniset tiedot	Irrigation techniques. Centre pivot and moving lateral systems. Part 2: Minimum performances and technical characteristics
SFS-EN 12325-3:en	2000	Sadetustekniikka. Säteittäin ja lineaarisesti etenevät sadetuskoneet. Osa 3: Nimistö ja luokittelu	Irrigation techniques. Centre pivot and moving lateral systems. Part 3: Terminology and classification
SFS-EN 12484-1	1999	Sadetustekniikka. Automaattiset turpeen sadetusjärjestelmät. Omistajan laitteistolle asettamien vaatimusten määritelmät	Irrigation techniques. Automatic turf irrigation systems. Part 1: Definition of the programme of equipment by the owner
SFS-EN 12484-2:en	2000	Sadetustekniikka. Automaattiset turpeen sadetusjärjestelmät. Osa 2: Tyypillisten teknisten ratkaisujen suunnitteluperiaatteet ja määritelmät	Irrigation techniques. Automatic turf irrigation systems. Part 2: Design and definition of typical technical templates
SFS-EN 12484-3:en	2000	Sadetustekniikka. Automaattiset turpeen sadetusjärjestelmät. Osa 3: Automaattiset ohjausjärjestelmät ja niiden hallinta	Irrigation techniques. Automatic turf irrigation systems. Part 3: Automatic control and system management
SFS-EN 12484-4:en	2003	Sadetustekniikka. Automaattiset turpeen sadetusjärjestelmät. Osa 4: Laitteiston asennus ja käyttöönoton hyväksyntä	Irrigation techniques. Automatic turf irrigation systems. Part 4: Installation and Acceptance
SFS-EN 12484-5:en	2003	Sadetustekniikka. Automaattiset turpeen sadetusjärjestelmät. Osa 5: Järjestelmien testausmenetelmät	Irrigation techniques. Automatic turf irrigation systems. Part 5: Testing methods of systems
SFS-EN 12525	2000	Maatalouskoneet. Etukuormaimet. Turvallisuus	Agricultural machinery. Front loaders. Safey
SFS-EN 12733:en	2001	Maatalous- ja metsäkoneet. Kävellen ohjattavat niittokoneet. Turvallisuus	Agricultural and forestry machinery. Pedestrian controlled motor mowers. Safety
SFS-EN 12734:en	2000	Sadetustekniikka. Liikuteltavien syöttölinjojen pikakytkentäputket. Tekniset tiedot ja testaus	Irrigation techniques. Quick coupling pipes for movable irrigation supply. Technical characteristics and testing
SFS-EN 12761-1	2001	Maatalous- ja metsäkoneet. Kasvinsuojeluruiskut ja nestemäisen lannoitteen levityslaitteet. Ympäristönsuojelu. Osa 1: Yleistä	Agricultural and forestry machinery - Sprayers and liquid fertilizer distributors - Environmental protection - Part 1: General
SFS-EN 12761-2	2001	Maatalous- ja metsäkoneet. Kasvinsuojeluruiskut ja nestemäisen lannoitteen levityslaitteet. Ympäristönsuojelu. Osa 2: Peltoruiskut	Agricultural and forestry machinery - Sprayers and liquid fertilizer distributors - Environmental protection - Part 2: Field crop sprayers
SFS-EN 12761-3	2001	Maatalous- ja metsäkoneet. Kasvinsuojeluruiskut ja nestemäisen lannoitteen levityslaitteet. Ympäristönsuojelu. Osa 3: Sumuruiskut pensaiden ja puiden ruiskutukseen	Agricultural and forestry machinery - Sprayers and liquid fertilizer distributors - Environmental protection - Part 3: Air-assisted sprayers for bush and tree crops
SFS-EN 12965:en	2003	Traktorit, maatalous- ja metsäkoneet. Nivelakselit ja niiden suojukset. Turvallisuus	Tractors and machinery for agriculture and forestry. Power take-off (PTO) drive shafts and their guards. Safety

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SFS-EN 13080:en	2003	Maatalouskoneet. Lannanlevittimet. Ympäristönsuojelu. Vaatimukset ja testimenetelmt	Agricultural machinery. Manure spreaders. Environmental protection. Requirements and test methos
SFS-EN 13118	2000	Maatalouskoneet. Perunankorjuukoneet. Turvallisuus	Agricultural machinery. Potato harvesting equipment. Safey
SFS-EN 13140	2000	Maatalouskoneet. Juurikkaankorjuukoneet. Turvallisuus	Agricultural machinery. Sugar beet and fodder beet harvesting equipment. Safey
SFS-EN 13406:en	2003	Maatalouskoneet. Lietevaunut ja levityslaitteet. Ympäristönsuojelu. Levitystasaisuudelle asetut vaatimukset ja levitystasaisuuden testausmenetelmat	Agricultural machinery. Slurry tankers and spreading devices. Environmental protection. Requirements and test methods for the spreading precision
SFS-EN 13448:en	2002	Maatalous- ja metsäkoneet. Niittokoneeseen tai niittomurskaimeen kiinnitettävä rivivälileikkuri. Turvallisus	Agricultural and forestry machinery. Inter-row mowing units. Safety
SFS-EN 13635:en	2002	Sadetustekniikka. Täsmäkastelujärjestelmät. Nimistö ja valmistajan toimittamat tiedt	Irrigation techniques. Localized irrigation systems. Terminology and data to be supplied by the manufacturer
SFS-EN 13683:en	2004	Puutarhakoneet. Yhdysrakenteisella moottorilla varustetut oksasilppurit. Turvallisuus	Garden equipment. Integrally powered shredders/chippers. Safety
SFS-EN 13739-1:en	2003	Maatalouskoneet. Lannoitteenlevittimet. Ympäristönsuojelu. Osa 1: Vaatimukset	Agricultural machinery. Solid fertilizer broadcasters and full width distributors. Environmental protection. Part 1: Requirements
SFS-EN 13739-2:en	2003	Maatalouskoneet. Lannoitteenlevittimet. Ympäristönsuojelu. Osa 2: Testimenetelmat	Agricultural machinery. Solid fertilizer broadcasters and full width distributors. Environmental protection. Part 2: Test methods
SFS-EN 13790-1:en	2003	Maatalouskoneet. Kasvinsuojeluruiskut. Käytössä olevien ruiskujen tarkastus. Osa 1: Peltoruiskut	Agricultural machinery. Sprayers. Inspection of sprayers in use. Part 1: Field crop sprayers
SFS-EN 13790-2:en	2003	Maatalouskoneet. Kasvinsuojeluruiskut. Käytössä olevien ruiskujen tarkastus. Osa 2: Sumuruiskut pensaiden ja puiden ruiskutukseen	Agricultural machinery. Sprayers. Inspection of sprayers in use. Part 2: Air-assisted sprayers for bush and tree crops
SFS-EN 13740-1:en	2003	Maatalouskoneet. Rivilannoittimet. Ympäristönsuojelu.Osa 1: Vaatimukset	Agricultural machinery. Solid fertilizer line-distributors. Environmental protection. Part 1: Requirements
SFS-EN 13740-2:en	2003	Maatalouskoneet. Rivilannoittimet. Ympäristönsuojelu. Osa 2: Testausmenetelmät	Agricultural machinery. Solid fertilizer line-distributors. Environmental protection. Part 2: Test methods
SFS-EN 13997:en	2004	Sadetustekniikka. Sadetusjärjestelmien kytkentä- ja ohjauslaitteet. Tekniset ominaisuudet ja testaus	Irrigation techniques. Connection and control accessories for use in irrigation systems. Technical characteristics and testing
SFS_EN 14049	2004	Sadetustekniikka. Sadetettava vesimäärä. Laskentaperiaatteet ja mittausmenetelmät	Water application intensity. Calculation principles and measurement methods
SFS-EN 27182	1993	Akustiikka. Moottorisahojen käyttäjän paikalle synnyttämän melun mittaaminen	Acoustics. Measurement at the operator's position of airborne noise emitted by chain saws (ISO 7182, ed. 1984)
SFS-EN 50144-2-13	2002		Safety of hand-held electric motor operated tools. Part 2-13: Particular requirements for chain saws
SFS-EN 50144-2-15	2001		Safety of hand-held electric motor operated tools. Part 2-15: Particular requirements for hedge trimmers
SFS-EN 50338	2001		Safety of household and similar electrical appliances. Particular requirements for pedestrian controlled battery powered electrical lawnmowers
SFS-EN 50338/A1	2004		Safety of household and similar electrical appliances. Particular requirements for pedestrian controlled battery powered electrical lawnmowers
SFS-EN 60335-2-70	2003		Household and similar electrical appliances. Safety. Part 2-70: Particular requirements for milking machines
SFS-EN 60335-2-77	2001		Safety of household and similar electrical appliances. Part 2: Particular requirements for pedestrian controlled mains-operated lawnmowers
SFS-EN 60335-2-87	2003		Household and similar electrical appliances. Safety. Part 2-87: Particular requirements for electrical animal-stunning equipment
SFS-EN ISO 3767-1:en	2001	Traktorit, maatalous- ja metsäkoneet sekä puutarhakoneet. Hallintalaitteiden kuvatunnukset ja muut näyttölaitteet. Osa 1: Yleiset kuvatunnukst	Tractors, machinery for agriculture and forestry, powered lawn and garden equipment. Symbols for operator controls and other displays. Part 1: Common symbols (ISO 3767-1:1998)
SFS-EN ISO 3767-3	1996	Traktorit, maatalous- ja metsäkoneet sekä puutarhakoneet. Hallintalaitteiden kuvatunnukset ja muut näyttölaitteet. Osa 3: Puutarhakoneiden kuvatunnukset	Tractors, machinery for agriculture and forestry, powered lawn and garden equipment. Symbols for operator controls and other displays. Part 3: Symbols for powered lawn and garden equipment (ISO 3767-3:199)

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SFS-EN ISO 3767-4	1996	Traktorit, maatalous- ja metsäkoneet sekä puutarhakoneet. Hallintalaitteiden kuvatunnukset ja muut näyttölaitteet. Osa 4: Metsäkoneiden kuvatunnukset	Tractors, machinery for agriculture and forestry, powered lawn and garden equipment. Symbols for operator controls and other displays. Part 4: Symbols for forestry machinery (ISO 3767-4:199)
SFS-EN ISO 3767-4/A1:en	2001	Traktorit, maatalous- ja metsäkoneet sekä puutarhakoneet. Hallintalaitteiden kuvatunnukset ja muut näyttölaitteet. Osa 4: Metsäkoneiden kuvatunnukst	Tractors, machinery for agriculture and forestry, powered lawn and garden equipment. Symbols for operator controls and other displays. Part 4: Symbols for forestry machinery. Amendment 1: Additional symbols (ISO 3767-4:1995/AM 1:2000)
SFS-EN ISO 3767-5	1996	Traktorit, maatalous- ja metsäkoneet sekä puutarhakoneet. Hallintalaitteiden kuvatunnukset ja muut näyttölaitteet. Osa 5: Käsin kannettavien metsäkoneiden kuvatunnukset.	Tractors, machinery for agriculture and forestry, powered lawn and garden equipment. Symbols for operator controls and other displays. Part 5: Symbols for manual portable forestry machinery (ISO 3767-5:199)
SFS-EN ISO 5353:en	1999	Maansiirtokoneet, traktorit, maatalous- ja metsäkoneet. Istuimen mittapisteen (SIP) määrittäminn	Earth-moving machinery, and tractors and machinery for agriculture and forestry. Seat index point (ISO 5353:1995)
SFS-EN 60335-2-91	2004		Household ans similar electrical appliances. Part 2-91: Particular requirements for walk-behind and hand-held lawn trimmers and lawn edge trimmers
SFS-EN ISO 8224-1:en	2003	Liikkuvat sadetuskoneet. Osa 1: Käyttöominaisuudet sekä laboratorio- ja kenttätestausmenetelmt	Traveller irrigation machines. Part 1: Operational characteristics and laboratory and field test methods (ISO 8224-1:2003)
SFS-EN ISO 11545:en	2002	Maatalouden sadetuslaitteet. Säteittäin ja lineaarisesti etenevät sadetuskoneet, joissa on joko ruiskutus- tai sadetussuuttimet. Sadetusveden levitystasaisuuden määrittäminn	Agricultural irrigation equipment. Centre-pivot and moving lateral irrigation machines with sprayer or sprinkler nozzles. Determination of uniformity of water distribution (ISO 11545:2001)
SFS-EN ISO 11680-1 + AC:en	2001	Metsäkoneet. Moottoroidut pystykarsintasahat. Turvallisuusvaatimukset ja testaus. Osa 1: Yhdysrakenteisella polttomoottorilla varustetut sahat	Machinery for forestry. Safety requirements and testing for pole-mounted powered pruners. Part 1: Units fitted with an integral combustion engine (ISO 11680-1:2000)
SFS-EN ISO 11680-2 + AC:en	2001	Metsäkoneet. Moottoroidut pystykarsintasahat. Turvallisuusvaatimukset ja testaus. Osa 2: Erillisellä selässä kannettavalla moottorilla varustetut sahat	Machinery for forestry. Safety requirements and testing for pole-mounted powered pruners. Part 2: Units for use with a back-pack power source (ISO 11680-2:2000)
SFS-EN ISO 11681-2:en	1998	Metsäkoneet. Moottorisahat. Turvallisuusvaatimukset ja testit. Osa 2: Moottorisahat puunhoitotyöhön. Muutos 1	Machinery for forestry. Portable chain-saws. Safety requirements and testing. Part 2: Chain-saws for tree service (ISO 11681-2:1998)
SFS-EN ISO 11806	1997	Maatalous- ja metsäkoneet. Kannettavat käsin ohjattavat polttomoottorikäyttöiset raivaussahat ja siimaleikkurit. Turvallisuusvaatimukset	Agricultural and forestry machinery. Portable hand-held combustion engine driven brush cutters and grass trimmers. Safety (ISO 11806:199)
SFS-EN ISO 14982:en	1998	Maatalous- ja metsäkoneet. Sähkömagneettinen yhteensopivuus. Testimenetelmät ja hyväksymisperustet	Agricultural and forestry machines. Electromagnetic compatibility. Test methods and acceptance criteria (ISO 14982:1998)
SFS-ISO 500	1991	Maataloustraktorit. Takavoimanottoakseli. Tyypit 1, 2 ja 3	Agricultural tractors -- Rear-mounted power take-off - Types 1, 2 and 3
SFS-ISO 730-1	1996	Traktorit ja maatalouskoneet. Kolmipistekiinnitys. Kokoluokat 1, 2, 3 ja 4	Tractors and machinery for agriculture. Three-point linkage. Categories 1, 2, 3 and4
SFS-ISO 2332	1994	Traktorit ja maatalouskoneet. Työkoneiden kolmipistekiinnitys. Vapaatilat työkoneen ympärillä	Agricultural tractors and machinery -- Connection of implements via three-point linkage - Clearance zone around implement
SFS-ISO 3767-2 + A1 + A2 + A3	2001	Traktorit, maatalous- ja metsäkoneet sekä puutarhakoneet. Hallintalaitteiden kuvatunnukset ja muut näyttölaitteet. Osa 2: Maataloustraktoreiden ja maatalouskoneiden kuvatunnukset	Tractors, machinery for agriculture and forestry, powered lawn and garden equipment -- Symbols for operator controls and other displays
SFS-ISO 5289	1995	Maatalouskoneet. Päättömät kaksoiskiilahihnat ja vastaavat hihnapyörien urat	Agricultural machinery -Endless hexagonal belts and groove sections of corresponding pulleys
SFS-ISO 5673	1995	Traktorit ja maatalouskoneet. Nivelakselit ja voimantuloakselin sijainti	Agricultural tractors and machinery -- Power take-off drive shafts and position of power-input connection
SFS-ISO 5675	1993	Traktorit ja maatalouskoneet. Hydrauliikan pikaliitin	Agricultural tractors and machinery -- General purpose quick-action hydraulic couplers
SFS-ISO 5678	1995	Maatalouskoneet. Maanmuokkauskoneet. S-piikit: Päämitat ja vapaatilat	Agricultural machinery. Equipment for working the soil. S-tines: Main dimensions and clearance zones
SFS-ISO 5692	1993	Traktorit ja maatalouskoneet. Mekaaniset kytkennät. Vetosilmukka	Agricultural vehicles -- Mechanical connections on towed vehicles
SFS-ISO 5713	1993	Maatalouskoneet. Maanmuokkauskoneet. Maata muokkaavien osien kiinnitysruuvit	Agricultural machinery. Equipment for working the soil. Fixing bolts for soil working elements
SFS-ISO 5718-1	1993	Sadonkorjuukoneet. Lattaterät pyöröniittokoneille. Osa 1: A-tyypin lattaterien määrittelyt	Harvesting equipment. Flat blades for rotary mowers. Part 1: Specifications for type A flat blades
SFS-ISO 5718-2	1993	Sadonkorjuukoneet. Lattaterät pyöröniittokoneille. Osa 2: B-tyypin lattaterien määrittelyt	Harvesting equipment. Flat blades for rotary mowers. Part 2: Specifications for type B flat blades
SFS-ISO 6489-1	1993	Traktorit ja maatalouskoneet. Mekaaniset kytkennät. Osa 1: Vetokoukku	Agricultural vehicles -- Mechanical connections between towed and towing vehicles -- Part 1: Dimensions of hitch-hooks

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SFS-ISO 6489-3	1993	Traktorit ja maatalouskoneet. Mekaaniset kytkennät. Osa 3: Traktorin vetotanko	Agricultural vehicles. Mechanical connections on towing vehicles. Part 3: Tractor drawbar
SFS-ISO 6531	2003	Metsäkoneet. Käsin kannateltavat moottorisahat. Sanasto	Machinery for forestry. Portable hand-held chain saws. Vocabulary
SFS-ISO 6720	1993	Maatalouskoneet. Kylvökoneet, istutuskoneet, lannoitteenlevittimet ja ruiskut. Suositeltavat työleveydet	Agricultural machinery. Equipment for sowing, planting, distributing fertilizer and spraying. Recommended working widths
SFS-ISO 6814	2003	Metsäkoneet. Liikkuvat koneet. Termit, määritelmät ja luokittelu	Machinery for forestry -- Mobile and self-propelled machinery -- Terms, definitions and classification
SFS-ISO 7072	1994	Traktorit, maatalous- ja metsäkoneet. Rengassokat ja jousisokat. Mitat ja vaatimukset	Tractors and machinery for agriculture and forestry. Linch pins and spring pins. Dimensions and requirements
SFS-ISO 7112	2003	Metsäkoneet. Käsin kannateltavat raivaussahat ja nurmikon viimeistelyleikkurit. Sanasto	Machinery for forestry. Portable hand-held brush cutters and grass timmers. Vocabulary
SFS-ISO 7916	1992	Metsäkoneet. Raivaussahat. Käsiin kohdistuvan tärinän mittausmenetelmä	Machinery for foresty. Brush-saws. Measurement of hand-transmitted vibration
SFS-ISO 7917	1992	Metsäkoneet. Akustiikka. Raivaussahat. Melun mittaaminen käyttäjän paikalla	Machinery for forestry. Acoustics. Brush saws. Measurement of airborne noise at the operator's position
SFS-ISO 8910	1994	Maanmuokkauskoneet ja -laitteet. Kyntöaurojen työstävät osat. Sanasto	Machinery and equipment for working the soil. Mouldboard plough working elements. Vocabulary
SFS-ISO 10448	1996	Maataloustraktorit. Työkonehydrauliikan paine	Agricultural tractors. Hydraulic pressure for implements
SFS-ISO 11001-1:en	1994	Traktorit ja maatalouskoneet. Työkonekytkimet. Osa 1: U-kehyskytkin	Tractors and machinery for agriculture. Three-point hitch couplers. Part 1: U-frame coupler
SFS-ISO 11001-2	1994	Traktorit ja maatalouskoneet. Työkonekytkimet. Osa 2: A-kehyskytkin	Tractors and machinery for agriculture. Three-point hitch couplers. Part 2: A-frame coupler
SFS-ISO 11001-3	1994	Traktorit ja maatalouskoneet. Työkonekytkimet. Osa 3: Kourakytkin	Tractors and machinery for agriculture. Three-point hitch couplers. Part 3: Link coupler
SFS-ISO 11374	1994	Traktorit, maatalous- ja metsäkoneet. Työkoneiden nelipistekiinnitys	Tractors and machinery for agriculture and forestry. Four-point hitch for implements
SFS-ISO 11684	1999	Traktorit, maatalous- ja metsäkoneet sekä moottorikäyttöiset puutarhakoneet. Turvallisuuskilvet ja vaaratekijöiden kuvatunnukset. Yleiset periaatteet	Tractors, machinery for agriculture and forestry, powered lawn and garden equipment. Safety signs and hazard pictorials. General principles
SFS 2480	1971	Metsäkuljetuksen käsimerkit	Arm signals at forest transport
SFS 4102	1977	Maatalouskoneiden sanasto.Kuivurit	Agricultural machinery. Terminology. Driers
SFS-EN 1374	2000	Maatalouskoneet.Tornisiilojen kiinteästiasennetut tyhjennyslaitteet.Turvallisuus	Agricultural machinery. Silos stationary unloaders for round silos. Safety
SFS-EN 703	1995	Maatalouskoneet.Säilörehuleikkurit. Turvallisuus	Agricultural machinery. Silage cutters. Safety
SFS-ISO 3918	2001	Lypsykoneet ja laitteet.Sanasto	Milking machine installations. Vocabulary
SFS-ISO 5707	2001	Lypsykoneet ja laitteet. Rakenne ja suorituskyky	Milking machine installations --Construction and performance
SFS-ISO 6690	2001	Lypsykoneet ja laitteet. Testaus	Milking machine installations. Mechanical tests

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