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WIPO/IP/HEL/00/2
ORIGINAL: English
DATE: October 2000

NATIONAL BOARD OF PATENTS AND REGISTRATION OF FINLAND

WORLD INTELLECTUAL PROPERTY ORGANIZATION

FORUM ON CREATIVITY AND INVENTIONS – A BETTER FUTURE FOR HUMANITY IN THE 21ST CENTURY

organized by
the World Intellectual Property Organization (WIPO)
and
the National Board of Patents and Registration of Finland

in cooperation with
the Ministry of Trade and Industry of Finland,
the Ministry of Education, Science and Culture of Finland

and
the International Chamber of Commerce (ICC),
the International Federation of Inventors' Associations (IFIA),
the Confederation of Finnish Industry and Employers (TT),
the Finnish Inventors' National Federation (KEKE)

Finlandia Hall
Helsinki, October 5 to 7, 2000

INVENTION, INNOVATION AND CREATIVITY AS A PRE-CONDITION FOR EMERGENCE AND AN INSTRUMENT FOR THE SURVIVAL OF MANKIND, SOCIAL, HUMANITARIAN AND CULTURAL ASPECTS OF INVENTIONS AND INNOVATIONS, WEALTH CREATION THROUGH INVENTION, INNOVATION AND CREATIVITY (PHILOSOPHICAL, HUMANITARIAN, EMPLOYMENT AND DEVELOPMENT-RELATED ASPECTS)

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Introduction

1. Considering that I was born in the first half of the 20th century on a small farm which had neither electricity nor running water, and have experienced all that creativity and inventions have done to improve life and the future, I think it is not only just the right moment to think and discuss the future of mankind in the 21st century, but also the meaning of the term "better". I cannot remember exactly how small the world was without radios, televisions or even mobile telephones, but what a dramatic change has now occurred in social, cultural and economic environments as a result of technological and industrial innovations and inventions. Do we really understand the importance of this changing world, such that we can help humanity to improve and to judge future developments? I am quite serious about this question, since it is somewhat difficult to discuss this matter with my three children - born as they were in the second half of the 20th century, and more to the point, in a natural environment, but not on the farm which I mentioned.

2. What has really happened during the past few decades - can we describe creativity, inventions and innovations and realize what they mean in relation to our basic and more complex needs. The period in question was certainly one of mechanization and industrialization, which had two major effects:

- the main basic need, that of sufficiently high-quality food, which is even more than necessary and has now been met - at least in industrialized countries;

- the world has expanded dramatically, on a step-by step basis, as a result of the invention of modern communication and information technology.

3. I will come back to the food situation later but first I shall turn to the world of cyberspace. Today we can and must participate in everything that happens in all parts of the world, thereby allowing us to have a global view of all social, economic, cultural and technological developments. We even see the differences in life, living standards, wealth or whatever we might wish to call it. In the course of developments we have become more and more aware of the problems of this world, our responsibility no longer relates only to the farm, a few animals, a couple of children, agriculture and the proper upkeep of all these things. Nowadays, global problems and the question of how to solve them are of interest to us. If we really consider what we are able to do and how we might act, we might say that we are somehow helpless, or at least not very efficient.

4. So let us consider a better future for humanity as the principal target for the 21st century. Let us now return to the development of food production during the 20th century and prospects for the 21st century with respect to inventions and innovations.

5. The development and production of high quality food directly reflects the most basic human needs with their physiological and physical requirements. In addition, this has a considerable influence on the past, present and future of social, economic, cultural and technological developments.

6. If we consider the two-million year history of food production, technological progress has opened up the possibility, not only of developing novel preservation technologies, but also of taking into account new criteria linked to the needs and desires of today's consumer. In particular, the last decades of the 20th century witnessed the industrialization of food production and, at the same time development of the necessary household techniques. We

began with local raw materials and traditional products through the industrialization of well-known household techniques. This gave rise to small and medium-size production as well as regional and seasonal availability of products. Through further technological developments, we successfully achieved current large-scale industrial production with global and seasonal independent product availability and even an excessive amount of food.

7. This scenario applies to most of the industrialized countries but is only part of the reality. On the other hand, there are emerging and developing countries which live with hunger, malnutrition and poverty - affecting almost one billion people - and this will not change in the foreseeable future owing to population growth in these countries.

8. In general, industrial food production has been substantially improved, especially during the second half of the 20th century. Scientific and industrial infrastructure has been extremely important for these improvements, with the result that in industrialized countries sufficiently high-quality food is available. Even if this local, limited perspective appears to be very promising, a global perspective view and approach are necessary, if we intend to use creativity and invention to improve the quality of life worldwide. "Global" refers not only to social, economic, cultural and technological aspects, but also to all types of infrastructure, just as resources exist for the proper handling of all the tasks relating to the food chain, from the availability of raw materials to food production and consumption, or environmental aspects. Infrastructure also means education and use of synergies from multifaceted disciplines e.g. nutrition and health, engineering, biology, and agriculture. Global refers also to national politics and worldwide integration.

9. Current food production will be insufficient and sustainability must be improved - new scientific results and technologies are necessary to meet both demands and requirements worldwide. These include information technology, modern biotechnology and new results on nutrition and health prevention, as well as modern forms of processing for high-nutrient preservation.

New technologies and their impact leading to a better future for humanity

10. At the beginning of the 21st century, new technologies offer new possibilities and approaches for the worldwide development of improved quality of life - which in itself is an important but separate topic for discussion. The industrialization of food production was a continuous process based on research results from the engineering and biological sciences. Another interesting global aspect that we moved paralley from plants and animals as raw materials down through the hierarchy of nature, i.e. from microorganisms to microorganisms, e.g. moulds, bacteria, viruses and functional molecules. We gradually improved our knowledge with a top-down approach from products to product microstructure. Owing to development in the sciences of the microcosms and resulting new technologies, the future will be characterized by a bottom-up approach from molecular chemistry and biology to structured systems, e.g. food products. In the final analysis, nanotechnology will be the result of this development.

Information technology

11. One of the benefits of modern information technology is the globalization of the worldwide situation and living standards, achieved by means of available scientific and technological know-how. This allows local/regional developments using these virtual know-how resources helps to improve the situation of education. With a view to the future, virtual

universities and research institutions with hundreds of thousands of students provide high-quality education from all points of the globe. This also generates a substantial improvement in local infrastructures for economic development, including food production. Modern information technology therefore has not only a service function but also supports the establishment of qualified infrastructures for economic and technological development. Moreover, it has a substantial influence on social and cultural aspects.

The problem of world nutrition

12. Proper nutrition is one of mankind's basic needs. On one hand, this relates to a sufficient supply of raw materials and food processing and, on the other hand, we need more information and greater understanding of the relationships between nutrition and health prevention. New research results offer possibilities for the improvement of food quality and avoid deficiencies in essential nutrients and malnutrition with all the negative consequences that entails. With the average age of the population increasing, health prevention will become one of the essentials for a better life. Much research and use of medicinal and physiological data will be necessary in order to produce truly functional food designed to combat the various nutritional problems and appeal to consumer target groups.

Modern biotechnology

13. One of the consequences of considering life in molecular terms is the development of modern biotechnology. Although it has been established for thousands of years, at least in food production, only during the last few decades have we been able to use scientific results in the development of new products. Modern biotechnology has established the economic importance of medicine and pharmacy entirely in very clear terms. A typical example of the successful approach is insulin production via the human insulin gene applied in microorganisms. Traditionally, it was produced from animal glands, and an area in which the German company Höchst was one of the market leaders. Owing to difficulties with the authorities, Höchst was not alowed to use modern biotechnology for the purpose s of insulin production in Germany, the result being that Höchst's productivity and competitivity diminished and its market leadership waned. Nowadays, the population generally accepts the use of modern biotechnology in medicine and pharmacy, since it is seen as the only chance to develop treatments against cancer, AIDS, Alzheimer's and other diseases.

14. Modern biotechnology is also a tool used to improve the quality of crops throughout the whole entire food chain, i.e. in terms of better yields and sustainable agriculture as well as better nutrient composition and processing properties. Typical examples are not only resistance to diseases and losses during cultivation, but also the improvement of nutritional quality. It is quite obvious that in industrialized countries, which have an excessive amount of food these new developments are of minor importance. This has led to a very low level of acceptance or even substantial opposition among the public. However, our responsibility does not allow us to consider only local aspects since food is of global, social and humanitarian importance.

15. With almost 1 billion people suffering from hunger and malnutrition we have to find new solutions to solve these problems. A typical example is rice, which is one of the major food crops. In about 56 countries rice is the only basic food resulting in a substantial deficiency of vitamin A, causing underdevelopment, blindness etc. With the help of modern biotechnology it has been possible to create sufficient vitamin A production in rice, thereby solving this nutritional problem. Even with this exciting example of research and

development, once again we must consider matters globally, i.e. contemplate also this "golden" rice with its yellow-orange colour after we have eaten white rice for thousands of years, or to prove the bioavailability of the vitamin A, and so on. This example becomes even more important when we consider that the President of Kenya, becoming aware of this development and with similar nutritional problems in his country with its major crop maize, immediately asked the President of the USA, Mr. Bill Clinton, to support a crash programme for the development of a "golden" corn for Kenya. Given that rice, corn and wheat account for more than 50% of food energy intake, this shows the importance of such a development for nutrition worldwide.

16. Other essential developments relate to the removal of anti-nutrients, toxins or off-flavour components from crops, e.g. cyanogenic compounds from cassava, bitter peptides from lupines etc. This procedure has the advantage that no new genes must be incorporated, i.e. only existing genes are blocked, so that the production of dangerous molecules does not occur.

17. Modern biotechnology is directly related to the biochemical pathways of life and has the potential to solve worldwide nutrition problems in a manner similar to that of medicine. Local governments, international politicians and the multinational food industry are faced with the challenge of producing adequate regulations for the responsible application of these new technologies. Once again, it is necessary to analyze the problem globally in order to achieve solutions which guarantee the social, humanitarian and ecological application of these developments.

National governments and international industry

18. As already discussed, modern information technology has opened the borders for worldwide communication and the transfer of know-how. A further active way to support the creation of a better future for humanity may stem from co-operation between national governments and international companies. Knowledge of local problems and international experience with high product and technological know-how offer synergies to create local enterprises and promote development. Nestlé's concept of local and ethnic food production, using local raw materials and Nestlé's leading technology is a form of successful local support also in developing and emerging countries. Nestle has about 500 production facilities worldwide with comparable social and economic standards in all parts of the world. Know-how transfer and Nestlé’s15 R&D facilities in 7 countries provide further support for technological development. In order to understand fully the impact of these activities, we have to recognize that it is not only a local food factory which offers employment or Nestlé's products, but also the influence on all parts of social and cultural life with the momentum it generates for its own commercial developments, raw material and local ethnic food production and last, but not least, on education.

Conclusions

19. New technologies and globalization cause dramatic changes throughout the world and provide real opportunities to contribute to social, economic and cultural developments, especially in developing and emerging countries. Limited rural resources as well as investments in sustainable food production require the development of these new technologies so as to ensure that they are properly applied.

20. In order to achieve positive results, it is necessary to understand the consequences of the shift from the traditional application of sciences during the 20th century to the development approaches of the 21st century. New technologies are concerned more and more with molecular sciences, which opens the door for investments in real new dimensions of research and the creation of new forms of intellectual prperty.

21. The resulting improvement in productivity leads to a competitive edge for certain countries, economic areas and so on, for example, the influence of information technology on the economy of the United States and in Asia. On the other hand, they offer future opportunities for emerging countries, as can be seen from the greencard discussion in relation to IT-experts in Germany.

22. Momentum for future productivity should be generated by nutritional research, modern biotechnology or nanotechnology. These emerging technologies are developing, based on our scientific progress. Since we are here together, trying to find out how to use it for the improved future of humanity in the 21st century, we have to learn from our experiences in the 20th century. In terms of high quality food production, we have made substantial progress in industrialized countries. This is only the beginning, however, since there are future problems to be solved, not only in health prevention and nutrition but also in the preservation of resources, sustainability of food production and environmental protection.

23. With this experience and the future development of new technologies, we must globalize our know-how and its application in order to cross-fertilize and help to develop remaining countries so as to improve their social, economic and technological situation. This will help to develop local production and employment, and to achieve respect for local cultural identities. One of several different approaches is the use of Nestlés leading food technology to develop and support the use of local raw materials for the production of local ethnic food, and in helping to improve the local situation. This requires close cooperation between international companies and national authorities.

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