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Information society and the countryside: can *internet-based* systems bring income alternatives to rural areas?

Abstract: *The paper reviews seven types of Internet-based technologies and services that may be especially suitable for rural areas. Its main focus is to analyze, which of these applications could promote rural development and prevent further economic and socio-demographic decline in peripheral rural areas. In particular, we will analyze whether these technologies have the potential to create income alternatives for the rural population. The paper also criticizes the current rural development policy of the European Union, which is heavily biased towards the agro-environmental measures, largely ignoring the potential of Internet-based businesses and services for rural job creation.*

Key words: *rural development, information technology, internet, tele-work.*

Introduction

Today, rural areas in Europe are often in deep structural crisis. In many regions with less favorable climate, poor soils, or large distance to markets, the economic situation has been deteriorating for decades. *Peripheral* rural areas are suffering in particular. Agricultural income stagnated or even declined – despite heavy subsidies for the agricultural sector. At the same time, the agricultural labor market is shrinking in most parts of Europe. Income alternatives to agriculture and forestry, however, have remained rather limited. Consequently, young people often moved away from these rural areas for higher education and in search for better income opportunities. In many rural areas, the population has been stagnating or even declining. As our demographic analyses have shown (Heilig 2002), we must even expect a population *collapse* in some of the (more peripheral) rural parts of Europe during the next decades. Almost everywhere, the rural population has been aging rapidly – because of out-migration of young people, but also due to *extremely* low levels of fertility. Today, the average number of children in rural areas is typically *lower* than the average number of children in urban areas – such as is the case in Germany.

Economic stagnation and intrinsic population decline have frequently led to a reduction or downgrading of public and commercial infrastructure, such as postal services, public transport, road networks, or supermarkets. In a vicious circle, these trends further accelerated the out-migration of young people and further deterioration of social and cultural life. Contrary to public declamations of politicians, rural life in Europe is often boring, economically unattractive, and detached from the cultural, social, and economic vitality of urban areas and larger cities. It is therefore of paramount importance for a successful rural development to identify new ideas of how the rural economy could be revitalized. Mostly, these new economic initiatives will be outside the traditional sectors of agriculture and forestry.

It was often suggested that the Internet might play an important role in rural development. A number of projects had been implemented in the recent decade, but the high-flying expectations seldom materialized. The services and products, which were typically developed by techno-enthusiasts from the information technology (IT) and computer industry, had often little practical relevance for rural everyday life. In the late 1990s the European Union funded a number of *rural* IT projects through its “Esprit” program. Descriptions of these projects can be downloaded from the Community Research and Development Information Service (CORDIS) web site (<http://dbs.cordis.lu>). With all due respect, it has to be said that many of these projects were rather academic and conceptual in their approach. In most cases, we were not able to find any follow-up activities, such as actual implementation and commercial operation of the suggested telematic services. Apparently, many of these projects evaporated into thin air, as soon as the initial funding from the European Union had stopped.

In the present paper, we will analyze some widely discussed Internet services and products that might be especially relevant for rural areas, though not from a technological point of view, but from the perspective of rural development. In other words, we will discuss the *social, cultural, and economic potential* of these Internet technologies for rural areas.

Social, cultural, and economic potential of Internet services in rural areas

There are widespread expectations that modern information technology, particularly the Internet, could play an important role in rural development. However, as recent failures indicate, it is necessary to identify and select only those technologies and services that actually improve living conditions in the rural areas and are socially and culturally acceptable.

In principle, seven types of IT services in connection with the Internet seem to be relevant for the countryside:

1. **Systems in the (rural) tourist industry** for information, promotion, and easy booking (especially relevant for farm and winter tourism).

2. Various systems for **tele-working** (including services and applications for widely distributed or *mobile* tele-workers, tele-commuters, rural tele-centers, or tele-“cottages”).
3. **E-marketing** for farmers and small and medium enterprises (SMEs). This includes e-shops for direct marketing of (organically produced) food, but also e-shops specialized in cloths, handicrafts, and art objects, which are authentic for the area.
4. **Business-to-business solutions and logistics systems.** This includes e-trade platforms for farmers and small and medium enterprises (SMEs) and systems for tracking the safety of the food chain.
5. **Distance learning** applications, including applications for vocational training, higher education and university education.
6. **E-administration and online public services,** such as online permissions, certificates, applications to the local and regional political administration.
7. **Virtual communities** for the rural society, such as chat rooms and other services that specifically focus on the *social, cultural, and economic* interests of people living in the countryside. These virtual communities are typically organized through specialized *rural Internet portals*, which are often operated by farmers associations, rural grass-roots initiatives, and environmental or political activists.

We will now evaluate these Internet applications from the perspective of rural development by trying to answer the following analytical questions.

- a) Which of these applications could really provide **income alternatives** to the rural populations outside agriculture and forestry?
- b) Which application would make rural life more attractive to young people?
- c) Which Internet services can meet **existing demands**?
- d) Are there Internet technologies and applications that could **reverse the wide-spread trend of rural-urban migration**?

E-Tourism

The Internet is certainly *essential* for one of the most important alternatives to agriculture and forestry – namely the tourist sector in rural areas. Reservation, booking and customer information is rapidly switching from the conventional travel bureaus to Internet-based services. This is not only the case for the large-scale tourist industry. Today, even small farmers use the Internet very efficiently to attract visitors to their “holiday on the farm” programs. In Austria, for instance, you can book small mountain cabins from alpine farmers in Carinthia directly through the Internet (see for instance: <http://www.urlaubaufderalm.com/Leebhuetten.htm>).

The Internet has three *fundamental* advantages for people, who are unsure where to spend their vacation: a) They can easily *search* offers from a specific region and immediately compare facilities, prices, and other aspects. Most tourist busi-

nesses now have photos of their facilities and environment on the Internet. b) Potential customers can look for a vacation *at home*, whenever they have time (this is a clear advantage in those European countries such as Germany or Austria that still have absurdly strict regulations concerning the opening hours of travel agents). c) Potential customers can *directly contact* the tourist business without having to go through a travel agent (which might save costs).

The Internet is an excellent advertising and booking tool for farmers trying to get into tourism. With a fraction of the cost of other marketing tools (such as catalogues, trade shows, etc.), they can advertise their facilities to a very wide audience. In Austria, we have seen the emergence of a significant number of small regional Internet providers and web design businesses, which provide services to the rural tourism sector, including farm-based businesses. While these small IT businesses in rural areas cannot create a large number of jobs, they can provide possibilities for highly qualified young people, who previously moved away to a city.

E-Work

There can be no doubt that the Internet will change the way we work – not only in the tourist industry. In a knowledge-based economy, *everyone* will eventually use the Internet and other information technologies. The Internet provides a broad range of possibilities for companies to re-organize the workflow. Various forms of telework will become more common, as companies and employees find out about the advantages. Of course, not every business and every employee would benefit from tele-work. There are certainly business processes that require a team working in face-to-face interaction in a shared office space. Many people also prefer *direct* human interaction during working hours. But we also know that people would be happy to work 2 or 3 days *at home* in order to avoid the usual traffic disaster in our cities or to be close to their small children. There is also the group of mobile tele-workers, such as insurance and real estate agents or service mechanics, who drive around the whole day to their customers, connected by cellular phone (and in the future perhaps mobile Internet) to their base office.

In recent decades, an interesting shift in rural employment can be observed in some parts of Europe: a significant increase of service-sector employment. Actually, two thirds of the *new* jobs in these rural areas have been in the service sector. Surprisingly, these include many highly qualified positions in financial services, the IT industry, in architecture, research and engineering. Apparently, the development is triggered by a new trend of *long-range* sub-urbanization, where *highly qualified* urban professionals move into prosperous *rural* tourist and recreation areas. The trend can be observed in large parts of Bavaria's rural areas south of Munich (particularly around the Starnberger and Ammer lakes), where the executives and managers of Munich's high-tech industry often have their luxurious homes in rather exclusive "villages" (which only 20 years ago

were dominated by farmers). Similar areas can be found around most European capitals.

However, there are also former agricultural areas relatively far away from large cities, which have become extended “rural leisure and recreation parks” for high-tech professionals, wealthy pensioners and those, who do not have to work for a living. The region of Tuscany, and large areas around Lago di Garda are examples. In these areas, one can find numerous exclusive restaurants, golf courses, shopping centers and other facilities for the wealthy inhabitants (which need large numbers of service personnel). These facilities are not only for tourists from the outside, but also for the growing number of *permanent* wealthy inhabitants who have retired from the stress of city life.

These *prosperous* rural areas have become the European equivalents to the recreational and retirement zones in Florida, USA, which had also been farmland before the wealthy people from the cities in the North decided to spend their retirement there. In these new “rural” areas, the Internet obviously plays an important role. It links the wealthy inhabitants to their businesses – which are usually still in the bigger cities. Those, who are still active can often afford to work from home or drive to the city just once or twice a week to supervise the operation of their business. This new type of rural development through rich migrants may be limited to only a few, most attractive, rural areas; but it has significant implications for the rural world in general. These migrants bring fresh ideas, talent, and new perspectives to the rural world, which is often deadlocked in its development concepts on agriculture and forestry.

E-Marketing

There is also the idea that the Internet might be used by farmers (or networks of farmers) for direct marketing of their products (e-marketing). This would be a welcome step upward in the value chain for the farmer. The idea is to sell *processed* farm products such as cheese or sausages and thus achieve higher income than from selling milk to a dairy or pigs to the slaughterhouse. In theory, this appears to be a promising concept for improving farmer’s income. There are a few hundred *million* people on the Internet and if only a *tiny fraction* of them would order the products of a particular farmer, he or she could make a fortune. Unfortunately, this is a naïve idea. In practice, such Internet business often ends in a disaster.

The first problem is that production of primary products and processing of food are two tasks, which have been separated in modern societies for good reasons. The hygienic standard of a farm usually conflicts with the cleanness requirements in food processing (it is hard to guarantee sterile conditions when flies are buzzing all over the place). The investment necessary to guarantee hygienic food processing can be substantial. With small amounts of processed food, it is also usually impossible to undertake expensive laboratory tests of the finished

product for ensuring stable food quality and security. Finally, it is extremely *labor-intensive* to process food at the farm level. With small production amounts, one cannot invest much in labor-saving machinery. Farmers, who have started such farm businesses, are frequently complaining about the self-exploitation of the whole family for a small additional income.

The idea that there is a huge potential market of Internet users is also misleading. First, few food products can be mailed over long distances (an exception may be dried spices or mushrooms, honey, and certain types of sausages). There is also the problem of export regulations, which are quite strict for food items. For a farmer (or even a small network of farmers), this typically restricts the market to EU countries, because they do not have the capacity to take care of all export regulations and requirements. The most serious obstacle of e-commerce in the food sector, however, is the reservation of potential customers to buy food from a computer monitor. Most people like to buy food only if they can smell it, touch it, and taste it. Just watch, what people typically do on the vegetable and fruit stand of a supermarket. Even very powerful retail chains in Germany (Karstadt) have not managed to make e-commerce of food items a successful business. It may be possible to sell books, T-shirts, or movies over the Internet – but not (fresh) food. Only very few food products (such as very specific types of tea, spice) may be suitable for e-marketing.

E-Business solutions

In the early years of the Internet, many high-tech advocates promoted the idea of using this technology to establish *electronic trading places* for a broad range of products. Several businesses tried to convince farmers that it would be an advantage to trade grain, livestock and other agricultural products on their electronic exchange. For instance, the company AgraLink Exchange, a Canadian Internet business, introduced an e-trading platform for grain in 1997. In the meantime, they had to close down the operation due to a lack of interest among the farm community. On their web page, one can find the following statement: “*In spite of our successes on other industries, agriculture has not shown an interest in electronic trade. This is evidenced by the many failures of agriculturally oriented, web-based trading systems in the past year. Due to the low volume of transactions on our electronic grain exchange AgraLink has decided to cease operations of our marketplace.*” (www.agralink.ca)

This is certainly typical for many *agriculture*-related Internet applications. Only few (very large) farmers can organize their farm like an industrial enterprise. For the great majority of small to medium scale farms, which are typical for Europe, it is not worth the effort to implement and test new solutions that might *or might not* provide economic benefits.

The supply chain of farms concerning seeds, fertilizers, fuel and other inputs, is the long established business of specialized, often cooperatively functioning

organizations, which leave little room for Internet start-ups trying to take away their business. In Europe, most farms are too small to invest into business-to-business Internet solutions.

There are also plans to use Internet technology for controlling the integrity of the food chain – in particular to track livestock from its birth on a farm until its end as a piece of meat on a consumer's table. When BSE and other food scandals frightened consumers all over Europe, people certainly wanted to know *exactly*, where the particular pig or cow was raised, fed, and slaughtered, from which they bought a piece of meat in the supermarket. However, potential investors should think twice, before implementing costly tracking systems that might please only a small minority of consumers. Today, many customers are obviously more concerned with *price* than with quality and tend to buy very cheap meat and sausages in no-name packages from discounters.

However, other businesses in rural areas might use the Internet for business-to-business interactions. Especially in the tourist and recreation sector, we find larger companies that can use Internet technology for purchasing supplies and simplifying payment.

E-Learning

In recent years, many schools and universities enthusiastically adopted the idea of e-learning. Even very famous universities in the United States have started ambitious web sites with numerous courses for distance learning. In Germany, a Distance University (“Fernuniversität Hagen”) has transformed its complete curriculum into online courses and created a “virtual study center” (for details see: <https://vu.fernuni-hagen.de/>). And the European Union has spent millions of Euros to promote the concept of distance learning and support development of e-learning applications in its 5th and 6th Research Framework Programs. Could this technology help (remote) rural areas in Europe to better develop? Could e-learning provide better living conditions for young people in the countryside?

Study courses on the Internet have two great advantages: the student can work at home and choose the time for learning. The Internet (in theory) also provides a broader range of possibilities for improving the teaching materials (multi-media, video, simulation tools, etc.). Most students in distance learning programs are adults, who want to upgrade their school or university degree. The same group previously went to evening schools. While distance learning is certainly an excellent opportunity for this group of students, the advantage for students from rural areas is less obvious. Young people in rural areas typically welcome the opportunity to leave their village for a higher school or university (at least those, who have the ambition for higher education). It is an opportunity for them to meet new people and “see the world”.

E-learning was also discussed as a possibility of compensating for the consequences of population decline in rural areas. Due to the drastic birth decline in recent years, many schools in rural areas had to be closed down. Now the students are collected by buses for larger more distant school centers. Could distance learning help those children? Probably it cannot! Education – especially of children – is a *social* process. It requires face-to-face communication and interaction with other children and teachers. The idea of replacing teachers and school friends with a web page contradicts everything we know about the socio-cognitive interaction process of learning. It would be a pedagogical nightmare comparable only to the abstruse arguments in the early times of television, which promoted TV as a “tool for learning” (while in reality it is probably the best device for transforming children into passive receptors of sensory overload).

Children need to be motivated, supported and (sometimes) corrected for a successful learning experience. This can be only provided by sensitive human interaction. There is also overwhelming evidence from cognitive research that *physical activity* greatly promotes learning processes among children – an experience, which is really not encouraged in front of a computer monitor (Sibley and Etnier 2003; Keays and Allison 1995). E-learning, no matter how sophisticated the application may be, can never replace essential *human* elements in the learning process.

E-Administration

This is a field, where rural areas could certainly benefit from the Internet revolution. Rural citizens frequently complain that they are discriminated by the public administration, which is usually located in the bigger cities or provincial capitals. They often have to spend hours and travel long distances for getting permissions, certificates, legal documents and other administrative service products. Especially rural areas that have experienced population decline have frequently seen a reduction of public offices and services in recent years. In those cases, the Internet can be an excellent tool for actually improving (local) government services even in thinly populated rural areas. Some *regional* governments in Europe have started to develop *extensive* web sites, which provide a plethora of information sources and numerous interactive tools for getting permissions, subsidies, legal documents, addresses and many other items. A good example is the official web site of the Lower Austrian government, which is responsible for a primarily rural area with about 1.5 million inhabitants (see: <http://www.noel.gv.at/Homepage/>). One can find detailed documents, legal forms, and administrative regulations – essentially everything that a citizen might need from the regional government.

These web sites are excellent for the rural population, because they typically combine all relevant administrative information in one place, which can be easily accessed from home. They also typically include information and access to

several administrative branches – so people do not have to travel to offices in different places.

The Internet can also significantly reduce the costs of the public administration, once the initial investments into the technology and the associated reorganization of administrative procedures have been made.

E-Communities

In recent years, rural sociologists and activists of non-governmental organizations (NGOs) have promoted the idea of using the Internet to increase social cohesion in the countryside by establishing *virtual* communities. In fact, the Internet may be an excellent tool for the civil society to organize itself. Interest groups can easily coordinate their actions or exchange information through the Internet. Virtual communities are typically organized through specialized *rural* or agricultural **Internet portals**, which are often operated by farmers association, rural grass-roots initiatives, and environmental or political activists. These portals often try to provide a broad range of targeted information and services, such as *regional* weather forecasts, producer price information for farmers, information on EU regulations and subsidies, information on local cultural events, etc. For instance, English and French farmer organizations have used the Internet to coordinate demonstrations against government decisions or against Brussels' policies.

In 2001 and 2002, the IIASA European Rural Development (ERD) project conducted case studies, in which we asked rural entrepreneurs (both from the agricultural and non-agricultural sector) if they have ever benefited in their business from using the Internet. The results were disappointing. One Austrian farmer, for instance, told us that he spent *several evenings* trying to find information on the “optimal treatment of manure” on the Internet. He was quite enthusiastic about the possibility to easily *search* for specific information, but was more than disappointed, when he found nothing useful. The documents were either too specific (such as scientific papers on manure treatment from universities) or too general for practical application on his farm. He told us that he finally got the information by contacting a fellow farmer in a neighboring village, who had the same problem.

This example illustrates a general observation: the *content* on web sites of rural associations is often quite poor or otherwise inappropriate. One can typically find only addresses and rather general (administrative or legal) information. What is really missing is a web site that would provide *hands-on, practical suggestions* for improving farm operations or for starting a new rural business. In the United States of America web sites of farmer's organizations or rural interest groups are much better than in Europe. There one can find numerous detailed hints and suggestions for farmers and rural businesses on how to improve opera-

tions. These Internet-based “extension services” are provided by the US Department of Agriculture, but also by numerous local or regional organizations.

The Internet can only become useful for various groups of the rural society and economy if rural web sites become *much* better. They must provide useful *content* – and not just graphics and superfluous information.

Some Data

So far, we have discussed Internet-based systems and services in Europe’s rural areas based on anecdotal evidence. Now it is time to check some statistical data. Unfortunately, we were not very successful in our search for hard facts. While we could find sufficient statistical material on the *overall* penetration of information and communication technology, there is almost nothing available for *rural* areas. For instance, the voluminous Status Report on European Telework (*European Telework Online* 1999) does not include a single table or chart, which would provide the number of tele-workers by place of rural or urban residence. All we could find were *national averages*. This is rather strange, because we have to assume that a significant proportion of teleworkers live in rural areas or at least in the rural fringe of urban areas. However, we found some statistical material that provides insight into the structure of Internet-based products and services, which we can use to evaluate the potential of the various applications.

Table 1 provides data on e-business in selected OECD countries for the year 2000. The United States of America was leading, by far, in Business-to-Customer (the so-called B2C) transactions. The overall volume in B2C transactions (that is customers buying from e-shops) was 25.8 billion US\$; for comparison: electronic purchases of German customers amounted to 1.2 billion US\$ (*OECD* 2001, p. 51). In 2000, 16% of the working-age population in the USA were Internet shoppers; in Germany it was only 5% and in Italy only 1%. Some 27% of Internet users in the US have at least once bought from an Internet shop; in Germany and Italy it was only 17% and 7%, respectively. In the US almost 20 million people bought in Internet shops, in Germany it was just 1.4 million and in Italy only 360 thousand. This clearly indicates that in 2000 Europe was far behind in Internet commerce. We could not find hard data on e-commerce in Eastern Europe, but very likely, it was even less developed – actually non-existent (*The Center for Democracy & Technology* 2001).

In Table 2, we have used data from Forrester Research, which is a US-based IT market research firm that produced e-commerce forecasts (cited from *OECD* 2001, p.67). It shows the maximum expected market penetration of e-commerce for selected product groups, based on household surveys in the United States of America. According to these projections, 50% of computer software will be bought over the Internet, some 44% of computer hardware, and some 25% of music (CDs or MPEG files). It is interesting that the lowest expected market penetration of e-commerce will be in the food and beverage sector: Forrester

Table 1. Business-to-consumer e-commerce indicator in selected countries for 2000

	Number of Internet Shoppers			Value of Transactions (US\$ million)	Penetration of Retail Sales (in %)
	thousands	as percentage of Internet users	as percentage of working-age population		
United States	19 666	27	16	25 845	1.0
Japan		20	6	7 644	0.3
Germany	1 370	17	5	1 199	0.3
France	310	7	2	345	0.1
Italy	360	7	1	194	0.1
United Kingdom	970	18	5	1 040	0.4
Canada	811	12	4	774	0.3
Australia	1 335	10	4	380	0.4
Austria	120	13	2.2	96	0.2
Belgium	90	11	3	82	0.2
Denmark	90	16	9	193	0.2
Finland	160	10	4.7	51	0.2
Greece	30	11	0.4	–	–
Ireland	40	13	1.6	–	–
Korea	2 140	15	7.7	1 008	1.0
Netherlands	320	12	5	182	0.3
Norway	100	19	11	61	0.3
Portugal /1	50	10	1	–	–
Spain /1	220	7	1	70	0.1
Sweden	260	10	4.6	232	0.7
Switzerland	130	12	2.7	127	0.3

/1 Portugal and Spain have been combined in the total transaction value and penetration rate of online sales.

Source: Extracted and adjusted from: OECD, 2001, p. 51

Original Sources:

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2000 Korea Internet White Paper, October, 2000.

Research thinks that only 7% of food and beverages will be eventually bought over the Internet (and this percentage will only be reached in 2009). This is a clear message that farmers should not be too optimistic about their possibilities of using the Internet for direct marketing.

Table 2. Expected uptake of e-commerce in selected product groups in the USA

	Maximum Expected Penetration	Year of Expected Maximum Uptake
Software	50	2003
Computer Hardware	44	2004
Music	25	2004
Apparel	17	2009
Event tickets	17	2005
Books	16	2004
Health & Beauty	16	2006
Flowers	14	2004
Toys	14	2006
Consumer Electronics	13	2006
Appliances	12	2003
Photo & Film	10	2005
Food & Beverages	7	2009

Source: Extracted and adjusted from: OECD, 2001, p. 67.

Original Source: Forrester Research, 1999.

While B2C e-commerce is still in its infancy, telework has certainly taken off. Table 3 provides statistics from the Status Report on European Telework (*European Telework Online* 1999, p. 29). According to these statistics more than 8% of the labor force in Scandinavia were teleworkers – the majority (65%) home-based, some 20% self-employed, and roughly 30% mobile (please note that there is an overlap, because teleworkers can be classified in two or three categories). In Germany and Austria only 4.4% of the labor force can be classified as teleworkers – with a relatively large percentage of them self-employed. In Spain, Portugal and Greece, teleworkers are less than 2% of the labor force.

Table 3. Types of Teleworkers by selected european regions, 1999

	Teleworkers as Percentage of Workforce /1	Percentage split between type of telework			
		Home-based	Self-employed in SoHos /2	Mobile	Multiple types (Overlap)
Scandinavia	8.2	65	20	30	15
Benelux	7.5	49	27	51	26
United Kingdom / Ireland	4.6	50	19	44	12
Germany / Austria	4.4	35	34	33	3
France / Italy	2.6	54	12	42	8
Spain / Portugal / Greece	1.9	63	12	25	0
European Union (15)	4.0	49	23	38	10

/1 Excluding supplementary home-based telework of employed persons of less than 1 day per week.

/2 SoHo: Small Office/Home Office.

Source: Extracted and adjusted from: European Telework Online (1999), p. 29.

Discussion and Recommendation

Political and academic discussions of rural development in Europe very rarely take into account the dimension of modern information technology. For instance, in a detailed Synthesis Report on the Nature of Rural Development in Europe, the term “Internet” or “information technology” does not appear *once* (Baldock et al. 2001). Another example: the European Commission has a Directorate General on the “Information Society”. However in its vast website we could, find very little on the topic of information technology *in rural areas*. One of the few specific documents is a brief draft on “Information Society as Key Enabler for Rural Development and Integration” (European Commission 1999). Unfortunately, the document includes very little substantial discussion of the problems and opportunities of information technology in rural areas – it is primarily a collection of general policy statements and references to related EU programs.

Even more disappointing are the “rural development” documents from the EU Directorate General of Agriculture (see: http://europa.eu.int/comm/agriculture/rur/index_en.htm and http://europa.eu.int/comm/agriculture/rur/publi/index_en.htm) One would expect to find at least some specific material concerning the relevance of modern information technology for rural development. But a search of available documents yielded almost nothing. For instance, the Rural Development section of the EU web site prominently displays a Fact Sheet on “CAP Reform: Rural Development”, which gives an overview of the Commission’s Rural Development policies. The term “Internet” does not appear in that document, neither the term “information technology”. The same situation we found in a document on “Mountain areas and rural development” – not one word about the Internet or modern information technology (maybe the authors of this document should, for a change, search the Internet to find *hundreds* of farmers, advertising their mountain cabins for tourists). The main “Working Document” of the European Commission’s Directorate General for Agriculture on “Rural Development” (July 1997) includes a short paragraph about Information Technology. In a 74-page document, however, we would have expected a little more than just a few lines on that important topic. Finally, we checked the 2001 Report on “The Agricultural Situation in the European Union” (published in 2002). There is a short section on Information and Communication Technology (ICT), but it primarily deals with systems implemented by the EU Commission to monitor and check and manage subsidies and other CAP measures in the agricultural sector or improve statistical reporting.

We found it rather surprising that all these EU documents are talking about *RURAL* Development, while, in fact, they almost exclusively deal with *agro-environmental* measures, processing and marketing of *agricultural* products and the social and economic conditions of *farmers*. This clearly illustrates the strong emphasis on agriculture of those responsible for the EU’s rural development programs. Rural development is still seen as predominantly agriculture- and environment-related. However, this approach ignores the reality in many

rural areas of Europe, were high-tech businesses, specialized health services, recreation facilities, tourism, and many other *non*-agricultural businesses are already dominating.

Information technology, and in particular the Internet, has become one of the fundamental driving forces of global economic modernization – today still primarily in the urban-industrial world, but also in a few rural areas – particularly those that live from tourism. While rural areas (particularly in Central and Eastern Europe) still lag behind in Internet use (*The Center for Democracy & Technology* 2001; Stenberg, et al. 1997), this will certainly change during the next few years, as more and more businesses begin to understand the advantages of this technology. In the US, many farmers already use the Internet for e-mail, for accessing (producer-) price information or weather forecasts, for advertising their farm-tourism facilities or for getting information about improved production methods, commodity markets, subsidies and farm regulations. In 1999, some 29% of all US farms had Internet access, and 43% of those with sales of over \$ 100,000 (Stenberg 2000).

This paper suggests that much more attention should be given to *Internet-related initiatives in rural development*. Despite some high-flying ideas in the 1990s that did not result in economically viable solutions, Internet business is far from dead. We are now seeing the first large-scale Business-To-Customer (B2C) operations becoming profitable (such as AMAZON, e-bay, etc.), while Business-To-Business (B2B) Internet solutions are already dominating in many industries. New information technologies will be introduced shortly; such as a new wave of high-bandwidth telecom services (UMTS), which will greatly expand possibilities for *mobile* Internet-based, multi-media services. The people in rural areas cannot afford to ignore all this and nurture dreams of a traditional agricultural world dominated by farming. As the diversification in the rural economy continues, Internet-related services will become increasingly important.

If we want to keep (young) people interested in the rural world, we have to actively develop those economic sectors and technologies that will create the (rural) jobs of tomorrow – and not the highly subsidized jobs of the past.

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Role of tourism in development of rural marginal areas (region of Šumava Mts. in Czech Republic)

***Abstract:** Marginality is a complex phenomenon resulting from the specific natural, economic as well as socio-cultural attributes of individual regions. It includes impossibility (of majority) of the population living in a given territory to integrate itself into the main developmental trends (e. g. Moller 1995; Sirovátka 1997). Transforming marginality into comparative advantage can be seen as one of promising ways to overcome it. As a region marginal from socio-economic perspective, but highly attractive as tourist destination, Šumava Mts. were chosen as a model area to demonstrate the idea. Documented by empirical findings, the latest history of the region is discussed in terms of assessing the strong and weak points of developmental strategy adopted by the region, which is based on tourism as the main agent fostering region's socio-economic wake.*

***Key words:** marginality, marginal area, rural areas, regional development, tourism.*

Introduction

Marginal areas

Regional development is generally based on exploitation of local resources, both natural and socio-economic. As the conditions are unique in any particular case, each region follows different trajectory of its development, despite the tendencies of central government to level, at least to some extent, conditions on the nation-wide scale. As a result, there have always been centres and peripheries. Being in the centre or in the periphery, however, was attributed to different regions in different periods during the course of history. Centres or main focal points of socio-economic development were then the territories that were able to utilize their features in the form of comparative advantage on the market. The others, unable to do that, became marginal, standing out of main developmental trends. Seen from this perspective, marginality has to be regarded as a context-dependent attribute, rather than an absolute one. Regions, considered marginal from one perspective can thus become focal points if put into another context.

Marginal areas in the Czech Republic

Marginal areas, as having emerged during the post-war history on the territory of the present Czech Republic, spatially coincide with what can be generally called rural space, particularly with mountain ranges and their piedmont areas. The effort of central government to bring the conditions there on a par with those in the rest of the country was mainly manifested through subsidising of intensive agriculture – the main source of job opportunities for local people – which otherwise would have been unprofitable. Since the political change in 1989, the agrarian sector as a whole has been undergoing profound changes. This has led, among other things, to decline of productive agriculture in mountain areas. As the process seems to be irreversible, new economic activities are searched for to substitute or at least complement the fading out productive agriculture in order to enable local populations to preserve sustainability. Otherwise, depopulation tendencies draining local population, primarily its young and qualified members, to towns, would increase.

Discovering of tourism

In this context, tourism was believed to play a role of a factor that local socio-economic development can be based on. The idea is built on the hope that the very disadvantages of marginal areas such as their rural character, distance from big centres and surviving traditional cultures and lifestyle, may become comparative advantages. This sounds quite reasonable, since contemporary tourism, or at least some of its forms, can be seen as an expression of the increasing importance of non-material forms of production and consumption, including the well-documented demand for „rurality“ and the associated attributes of closeness to nature, healthy environments, tradition, heritage and authenticity (Jenkins et al. 2001). For tourism that can be characterised as small-scale, decentralised, friendly to natural as well as cultural environment, and based on active participation of locals, the term “rural tourism” has been coined. Its development is promoted and financially supported by the state as well as by the European bodies.

Suggesting rural tourism as an agent fostering development of mountain rural areas raises, however, one principal question, namely: how to manage this phenomenon appropriately, as there is worldwide evidence that tourism is not unambiguous phenomenon at all. This is true generally about tourism; its rural form is not exception. Its close association with the attributes of marginality means at the same time fragility of the related development as rural tourism booms or goes down in dependence on quality of these attributes. There is no doubt that mountain tourism derives partly from the romantic idealism of people jaded by urban living for, as McCannel (1976) noted some years ago, travel has a romantic aspect. Much of this may be seen as related to the current environmental movement in which a return to simplicity and wholesome living is stressed. This statement is half of truth only, as it does not deal with behavioural patterns of majority of the present-days visitors to mountain regions, at least in

Central European milieu. The empirical evidence seem to support another perspective, pointed out e.g. by Bauman (1995) who uses the metaphor of a tourist to describe one of the post-modern phenomena – human uprooting. Tourism's essence lies in 'otherness', contrast and in organised dislocation from the everyday (Smith 1989). At the same time, however, tourism presupposes their opposite, eventual return to the familiarity of everyday life – and this expectation of return is a prerequisite for a worthwhile tourist experience. Being not tied to one specific place tourists, in this perspective, can move freely and change environment they want to stay in. The only thing they cannot change, however, is their style of living which is that of urban people (Price et al. 1997), in which consumer's aspects dominate.

There are other questions worth taking into account, as well, when thinking about the role of tourism in regional or local development. The concept of rural tourism is an idea that was designed outside the rural space itself. Thus, it is necessary to ask if the potential host community identifies itself with the concept. In other words: it is necessary to ask to what extent, if ever, the host community is able or willing to realize it. In the context of recent Czech professional literature, relevant studies discussing this theme are missing. The existing studies primarily focus on suggesting the way to start rural tourism, and to make local population feel involved. From the formal viewpoint they are rather normative manuals describing how to reach a desirable future. Rural tourism is viewed a priori as a positive phenomenon in these studies – something worth to be developed (e.g. Jelšík 1997; Maier 1998; Stříbrná 1997; Kecková 1997; Hošek 2000). The question whether rural space itself meets the preconditions necessary and the local population's ambitions for this way of development has not yet been raised at all. However, according to some field investigations (e.g. Havrlant 1999; Bartoš et al. 1998; Kušová et al. 1998, 1999, 2000), in areas expected to be suitable for rural tourism development, the passivity of local population has proved to be the decisive factor hindering the introduction of new activities of any type. Similarly, domestic studies on potential negative impact of rural tourism on host territory are still not available. And experience from abroad is not unanimous at all. Generally, tourism is perceived both as a benefit and a threat – depending on its forms and intensity. Optimistic perspective is that of tourism as a factor contributing to economic prosperity. Pessimists view tourism mainly as expansion of urban lifestyle, building economic barriers and „occupation“ of the host territory (Librová 1994; Šípek 2001).

The case of Šumava Mts. in Czech Republic

Historically marginal area

The region of Šumava Mts. is the area of a mountain range situated in the south west part of the Czech Republic. Thanks to its geographical position this area retained its natural character almost by the end of the first half of 20th century. The settlements and the natural resource exploitation, however, had been there

for centuries – particularly glass and wood processing industry – leading to a long tradition of harmony between man and nature. The post-war period of development was characterised by the ethnic shift in 1946. Establishment of the “iron curtain” and of the military training areas in this territory were other specific phenomena the territory was famous of. Location on the border separating the East and West European political alliances, distance from political-economic and cultural centres and the predominantly rural landscape were the main factors maintaining the region as economically marginal. On the other hand, the natural beauty of the area remained preserved. As a result, large-scale nature protected areas were proclaimed there – the Šumava Protected Landscape Area in 1963 and the Šumava National Park in 1991 (Figure 1).

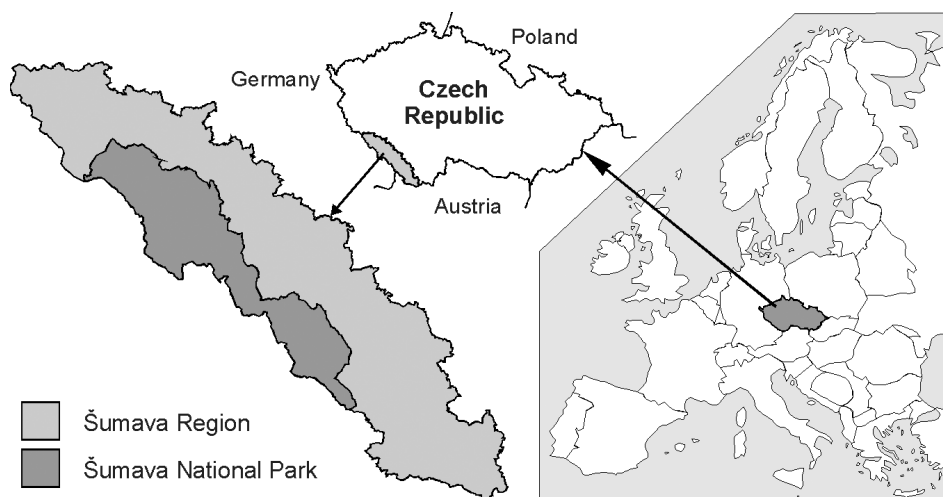


Figure 1. Location of the Šumava Region

Political change that took place in Central and Eastern Europe in 1989 introduced quite a new situation. Due to this process the Šumava Mts. region was plunged immediately into the European context, obtaining thus a chance of ceasing to be marginal.

Recognition of tourism internally as well as externally

Tourism has a long tradition in the Šumava Mts. region, dating back to the end of 18th century (e.g. Bašta 1913; Moss et al. 2000). Tourism was always an indisputable part of local economy. However, as a source of income it was viewed differently in different periods. Since the beginning of the 1990s, tourism has been expected to become the most important factor forming the future of the region. (e.g. Těšitel et al. 1999). Recognition of attractiveness of the territory for tourists as the most promising attribute of the region originated evidently from a very good knowledge of local people not only as regards the natu-

ral beauty of the territory but also as regards the local socioeconomic situation of that times. The territory was historically equipped with recreational facilities of different kind, as it has been a target territory for Czech as well as foreign tourists for a long time. There have been facilities as well as tradition which new development has been based on.

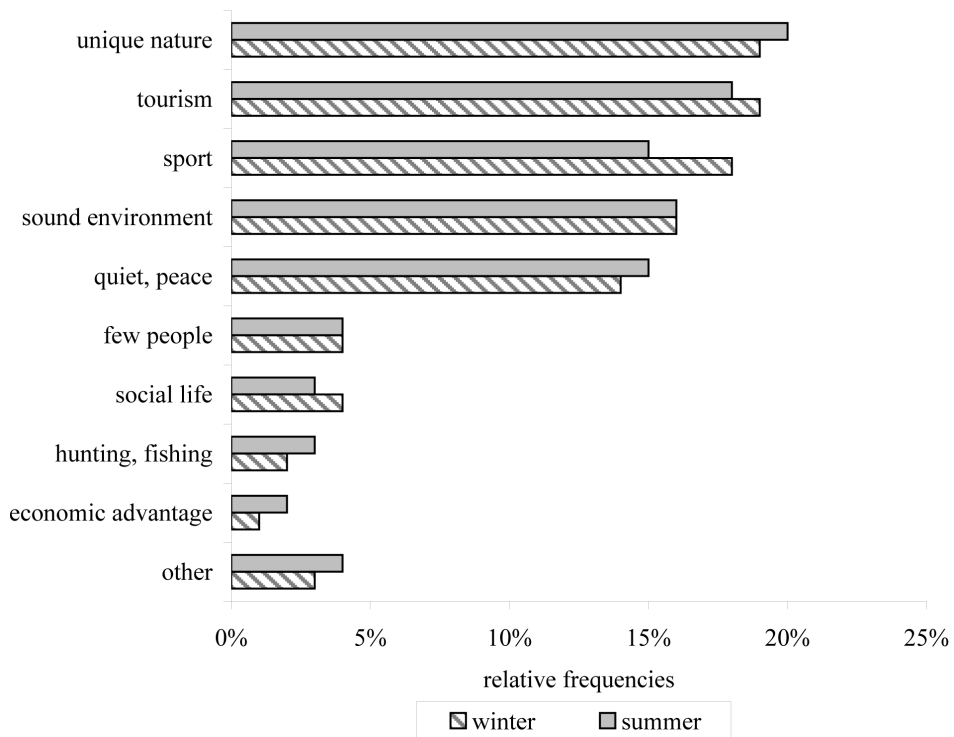
In some respect, tourism can be generally considered as a phenomenon accompanying urbanisation. The increase of urbanisation enhances the demand for recreation especially that, which is realised outside the everyday residential area. „Escape from the city“, as the phenomenon was expressively named by Honzík (1965), was not so widespread at his time. The cause, however, seems to be the same even in comparison with current situation – “non-habitable” urban environment and the possibility of leaving it (in the sense of time, economy and transport). Spreading urbanisation entails a vicious circle, when a swelling city destroys its recreational background and expels its inhabitants to the more and more remote countryside. We can witness a difficult situation: there are more tourists or, generally, people seeking the landscape, and at the same time there is less space where they could realise their desires. This contradiction results in the increasing importance of mountain areas as the recreational background for towns (Librová 1987, 1988). Viewed from this perspective, Šumava Mts. region with its relatively untouched nature has been recognised externally – by tourist clientele – as an ideal destination.

Emerging paradox

The numbers of tourists visiting the Šumava Mts. and the particular forms of tourism there have been changing over time, motivation, to visit the region, however, has been remaining more or less the same – seeking for beautiful nature, quiet and physical exercise¹ (Figure 2).

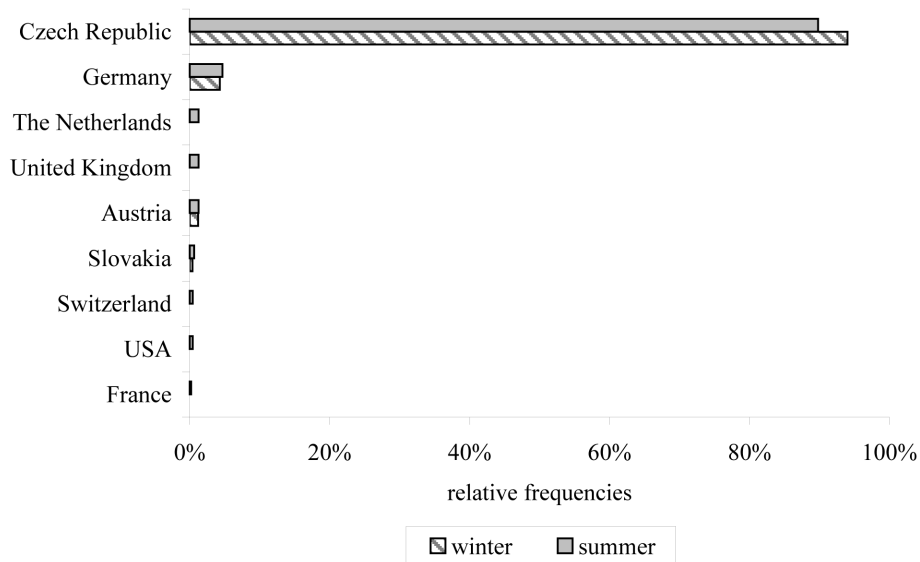
Šumava Mts. can be seen as all-year-round visitors’ destination with, however, two main seasons – summer and winter. Based on the data acquired it is possible to state that there are only minor differences between the winter and summer clientele with regard to their demands, expectations and behavioural patterns. Though lying along the Czech – Austrian – German border, the Šumava Mts. region is a recreational territory mainly for the Czech clientele (Figure 3). The boom of foreign visitors – mainly Austrians and Germans, evident at the beginning of the 1990s, is definitely over. The statement of the absolute dominance of the Czech clientele applies to the open landscape of the mountains in general.

¹ Particular aspects of tourism development in the Šumava Mts. region became a subject of some research projects. Recently, an international project was launched, entitled “Supporting and promoting integrated tourism in Europe’s lagging regions (SPRITE)”. It is aimed at comparing conditions for conduct of rural tourism within the following six European countries: Czech Republic, Greece, France, Ireland, Spain and United Kingdom. The territory of the National Park in the Šumava region was chosen as one of model areas. The project analyses tourism as a multifaceted phenomenon that can be described as an interplay among six principal actors involved: tourists themselves, host community, businesses, resource controllers, institutions and gatekeepers (see <http://sprite.econ.upatras.gr/>)



Source: Deliverable 9 - Tourists and Gatekeepers Survey, Results and Analysis, Czech Republic. Projekt QLK5-CT-2000-01211-SPRITE

Figure 2. Reasons to visit the Šumava Mts

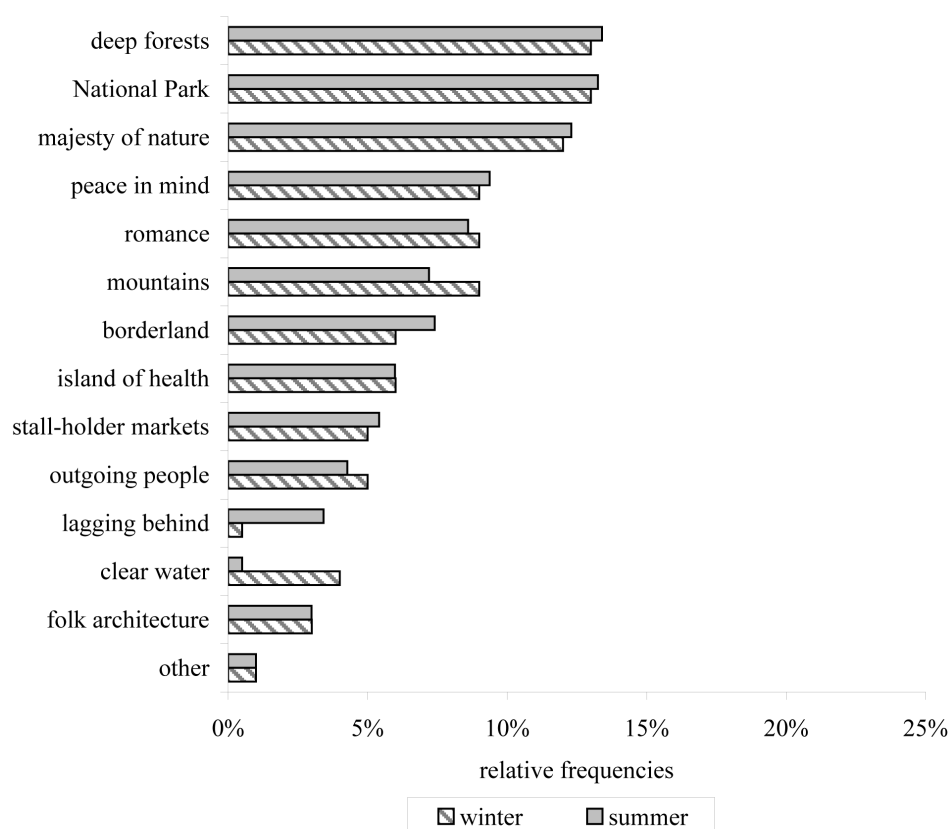


Source: Deliverable 9 - Tourists and Gatekeepers Survey, Results and Analysis, Czech Republic. Projekt QLK5-CT-2000-01211-SPRITE

Figure 3. Nationality of visitors to the Šumava Mts

There are, however, some individual “spots” where the composition of visitors might even be opposite, namely some local holiday centres, towns in the piedmont and the stall-holder markets close to state border crossing. Nevertheless, visitors usually come from the neighbouring areas and larger towns, such as České Budějovice, Plzeň, and, mainly, Prague. They can be thus seen as the typical sample of people visiting European mountains – domestic urban population.

People visiting the Šumava Mts. appreciate their “pristine” character (Figure 4). High value they give to the untouched nature might evoke the feeling that mountains assist in formation of their value system in favour to what was called earlier in this text the “return to simplicity and wholesome living”. It might be so; mountainous environment with its monumentality may really affect human views in many aspects, at least for the moment people are under the immediate influence of it. Nevertheless, under this skin there is a core of the life style patterns learned and experienced during the whole life, which are very hard to overcome during just a short stay in the mountains, no matter how monumental.



Source: Deliverable 9 - Tourists and Gatekeepers Survey, Results and Analysis, Czech Republic. Projekt QLK5-CT-2000-01211-SPRITE

Figure 4. Key words used by visitors to describe the image of the Šumava Mts

Everyday routine resists effectively to any change. As Bauman (1995) states, tourists take their homes with them when they travel. The home serves them as a point of reference, as standard to be used for evaluation of experiences. It is a point they would like to escape from, but only in order to have chance of returning to it with a bag of exotic experiences. It might be the reason why we can still hear voices among the visitors to the Šumava Mts., the same visitors admiring pristine environment, demanding „more and larger parking places“ for their cars, „more public WC meeting West European standard“, „maintaining and improving the system and quality of roads“, etc. Complaining about the lack of cash dispensers can be seen as an extreme wish in the direction of levelling the situation in the mountains with urban milieu.

Scenario that should not be neglected

Viewed through the conceptual scheme of Butlers' destination lifecycle theory (Butler 1980), Šumava Mts. can be seen as a territory that reached the point located between involvement and development stages of its lifecycle trajectory. As a result, negative aspects, e.g. some off-putting local phenomena, have not yet emerged and tourism is still generally perceived by locals as an unambiguous asset. The decisive arguments are mostly economic, i.e. creating job opportunities and financial profit in the form of taxes.

Paradoxically, it is a real behaviour of visitors themselves and their demands that seem to endanger tourism development within the Šumava Mts. region. Businesses in their effort to attract or at least to keep their clientele tend to do their best to satisfy „all visitors' wishes“. As a result we could see the ever-repeating cycle. Attractiveness of the host region, hospitality of the local communities, as well as readiness of local entrepreneurs may lead to paradoxical situation. Visitors flow would tend to expand, especially as more services and facilities catering to visitors needs are installed. The development of lodging, food and beverage, sewage disposal, recreation and entertainment facilities all would attract more visitors to the region, but at the same time alter its innate character. By doing this tourists would participate in the process of driving the Šumava landscape out of its natural „romantic" character.

Converting marginality into comparative advantage generated a chance to overcome the socio-economic marginality of the territory. Tourism development represents one of the promising ways for the Šumava Mts. region to do it. Nevertheless, once the territory's development will follow the way of recreational exploitation a „catastrophic scenario“ could not be a priori avoided. Economic development, if not limited, say, from the „outside“ (by the non-economic limitations) tends generally to gain the „maximum of profit“, up to the point, beyond which stagnation or even decline occur. Tourist industry of the present day type evidently follows this tendency. It threatens thus the continued existence of both the natural and cultural resources, on whose utilisation it is based. Reaching of the point of decline will likely be manifested by the territory having lost its

image of the „area left behind”, i.e. its *genius loci* and, consequently, its attractiveness.

The National Park of Šumava should be mentioned here as it proved to be a very important locally operating actor in this respect. In the course of its short lifetime, the national park has developed into an institution forming “external frame” for development of “soft” tourism on its territory – both restrictive and supportive. On one hand it sets limits on tourism development in terms of specifying its appropriate forms and intensity; on the other hand it has also started to take part in developing and maintaining of so called auxiliary infrastructure (information centres and services related to them, special public bus lines, forest roads, cross-country skiing trails, etc.). Thanks to its real socio-economic and legal power the national park has not yet allowed any large-scale tourism related activities to be realised on its territory. This is so despite the enormous pressures articulated by some local municipalities in the mid of the 1990s to establish a new ski centre on the slopes of the Smrčina mountain, located in the very core zone of the national park.

Regional development based exclusively on tourism industry is also, and in fact even more, threatened by the dynamics of „unpredictable” factors. Besides more or less predictable tendencies such as changes in “tourist density”, changes of climate conditions (snow layer,...) and economic trends (purchasing power of coming tourists, amount of leisure time,...), there might be intangible waves which are generally hardly predictable. One of such waves of fashion brought great numbers of western visitors to the Šumava Mts. territory immediately after 1989. It was fashionable to visit the „wild and left behind“ neighbours. The boom is over, however; other parts of Europe and the World having become more attractive for western tourists.

On the most general level it is possible to state that a system whose development would depend exclusively on utilisation of one source is very vulnerable. Tourism and leisure time activities, despite their potential and leading role, should not be considered the only way of further territory development. A diversity of economic activities seems to be the precondition necessary to ensure the flexibility of the social system, which, consequently, will strengthen its adaptability to future conditions in a long-term perspective.

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Ecological systems of water management in rural areas

Abstract: Poland has poor water resources. Moreover, they are unevenly distributed in space and time. Some types of human activity diminished water resources and increased the frequency of extreme phenomena such as floods and draughts. The development of rural areas depends on the quality and quantity of water resources. Suitable water management in rural areas can help enlarge water resources and minimize the negative effect of agriculture on natural flora and fauna. It should also allow for the increase of biological diversity.

One of the methods to improve water conditions is by increasing the retention abilities (water harvesting) of small basins. Field studies and approximate calculations showed that treatments consisting in the increase of swampy areas, number of water pools and small water reservoirs, elevating water level in eroded rivers and canals, improvement of the soil structure, regulation of outflows from the drainage systems, etc. can significantly enlarge water resources in river basins. Proper water management should enable the supply of good quality water both for the natural environment and for the agricultural and municipal needs.

Key words: water resources, water management, river basin, agriculture, environmental protection.

Introduction

Water management in rural areas all over the world has been for many years focused on creating conditions for intensive agricultural production. Thus, large reclamation systems have been constructed to fit water content in soils to the requirements of crop plants without considering environmental effects. In countries of the temperate zone the draining systems were mostly of concern while in the dry climatic conditions the irrigation systems were developed. The aim of reclamation works was often to transform inaccessible swamps into cultivated meadows and pastures. A large water uptake for agricultural irrigation as well as dense draining networks, together with intensive farming, resulted in unfavourable changes of the natural environment. The greatest changes were noted in river valleys, where rich and biologically diversified habitats were replaced by monocultures of cultivated meadows. Therefore, new solutions are sought to

enable a compromise between agriculture and environmental protection and to secure the sustainable development of rural areas. Hence, a new role of water management in rural areas, which, apart from economic demands, should also consider natural aspects.

The system of organisation of water management has recently changed in Poland. Regional Boards of Water Management were called into existence in 1991 (Regulation of the Minister of Environmental Protection, Natural Resources and Forestry) to comprehensively manage water resources within the river catchments. New Water Law significantly strengthens the competence of these bodies. Polish legislation refers basically to Directive 2000/60/EC of 23 October 2000 of European Council, which established general framework of European water policy. The directive pays special attention to the protection of water quality and to maintaining natural values of rivers and water reservoirs. It is recommended that waters achieve “good ecological status” in a definite period of time. Implementation of Water Framework Directive is one of the basic tasks for institutions responsible for water management in Poland.

The role of institutions responsible for water management for agricultural purposes in maintaining appropriate water quality (good ecological status) has been not decided yet. According to the water act, water management is as a whole within the responsibility of Ministry of Environment and the Regional Boards of Water Management, subordinated to it. However, the role of Ministry of Agriculture and Rural Development is still extensive. The latter is responsible for water consumption in agriculture, for exploitation of the draining-irrigation systems, for the maintenance of small water reservoirs, channels and rivers for agricultural purposes.

When discussing water management in rural areas one can not miss the structural changes that are now taking place in agriculture. Since the important political changes of 1989, national economy including agriculture underwent significant transformations. During a short period of time, Poland - formerly a country of food deficits - became a country with excess food production. Agricultural production has been abandoned on large areas, including those equipped with draining or irrigation-draining systems. The views on the role of agriculture in the national economy should thus alter. It is now assumed that agriculture should not only produce food but also (sometimes mainly) maintain and develop naturally the valuable cultural landscape. The role of agriculture should be also to protect natural resources including water resources. This is particularly important since water resources of Poland are small in comparison with those of the neighbouring European countries.

Adaptation of Polish agriculture to European standards requires deep transformation, particularly the enlargement of farms and intensification of their production. The necessary intensification of agriculture and consolidation of farms may pose a risk of decreasing biodiversity of the natural environment. Formation of large monocultures may increase surface runoff and thus unfavourably

affect water balance. This process is also suspected to increase the frequency of the extreme phenomena like floods and droughts. On the other hand, implementation of proper technologies in plant crops and animal breeding in modern farms may result in decreasing nutrient emissions to the surface and ground waters. Restructuring of Polish agriculture and particularly the increase of the size of farms is a source of fear for ecological organisations and of hope for economists responsible for the development of the country.

As can be seen from the above remarks, the combined, integrated approach to the three elements i.e. water management, food production (agriculture) and environmental protection has become a necessity and a challenge for users and managers of rural areas. Sustainable development of rural areas depends largely on co-operation of specialists from these three sectors. The ecological systems of water management should play a significant role in rural areas.

Water resources

Poland is one of the European countries with low water resources. Renewable resources of surface water, i.e. mean annual per capita outflow from the area of Poland, are 1580 m³ (data according to the Institute of Meteorology and Water Resources) whereas in Europe this index is equal to 4560 m³ (Zieliński, Słota 1996). These poor water resources in Poland are, moreover, very variable in time and space. In our climatic conditions, the highest flows in most rivers take place in spring and the lowest in autumn and winter. The ratio between the maximum and minimum average monthly outflow from the area of Poland is about 2.3. The ratio is considerably higher for some rivers and reaches a two-digit value for mountain streams and small lowland rivers. Momentary flows vary even more and the ratio between the minimum and maximum flow is almost 1 : 1000 (Zieliński, Słota 1996).

Precipitation is also unevenly distributed in space and time. The average annual precipitation in Poland is around 600 mm, but there are years with precipitation below 400 mm and with more than 800 mm. Much bigger differences are revealed when short-term precipitation is analysed. Annual sum of precipitation in Poland is sufficient to cover water demands. For most plants, however, evapotranspiration exceeds precipitation during the growing season. Water deficit varies in time and space. There are years of distinct deficits of precipitation, particularly in central Poland.

Extreme phenomena like floods and droughts are relatively frequent in Poland. It has been estimated that floods in the catchment area of Vistula river occur every 5 years on the average and in the catchment of Odra – every 7 to 10 years. An excess of water in agriculture results not only from floods but also from the long-lasting excess moisture levels in the soil. Yet in the 19th century there were periods of starvation caused by wet years (Okruszko 1997). The last great flood took place in the Odra basin in July 1997 and caused enormous economic and social losses. On the other hand, in many regions severe atmospheric, hydrologi-

cal or soil draughts occur and result in considerable losses for national economy, and especially for agriculture. It has been estimated that the drought in 1992 that affected almost whole territory of Poland resulted in the decrease of yields by at least 20%. Especially susceptible to droughts (Kowalczak et al. 1997) are the regions of central Poland.

Water resources develop in a space occupied by croplands and forests as a result of spatially and temporally variable precipitation (rainfall, snow). Precipitation is partly stored and utilized on these areas. The ability to store water is termed retention and such ability in different degree characterises river catchments. Water is retained in forests, soil, aquifers, terrain depressions and in natural and artificial water reservoirs. Retention enables keeping water from the periods of its excess (snow melt, large precipitation) and use it in the “deficit” periods (with no precipitation). Nevertheless, momentary high water stages in rivers, high soil moisture are natural as are the periods of water deficit, low water flow in rivers, soil over-drying and low groundwater tables.

Natural retention capacity of river basins in many areas has been significantly decreased as a result of deforestation, construction of drainage systems, covering the earth surface with impermeable layers of asphalt and concrete, degradation of mineral and organic soils, overgrowing (filling up) of ponds and small lakes, etc. It is believed that human economic activity contributed significantly to enhanced irregularity of the water flow in rivers and that it increased the frequency of extreme phenomena such as floods and droughts.

The measures undertaken so far to prevent from unfavourable influence of droughts and floods have been mainly technical in character and have included, in particular: construction of water reservoirs, of levees and dams, irrigation and drainage systems etc. In many cases the results achieved were not satisfactory. It is believed that securing of water balance and ways to minimise losses due to water excess or deficiency must be attempted by some other methods that would be closer to nature. One of the pro-ecological methods is to increase or reconstruct the retention abilities of river basins together with implementation of suitable rules of water management in agricultural areas.

Water management issues in agricultural landscape

The amount and quality of water resources determine land use and management of rural areas. The reverse is also true and thus we may observe here a distinct feedback relationship. Agricultural development depends upon water resources but their quality relies on the ways of agricultural utilization of the river catchment. That is why the problems of water can not be dealt with apart from the existing or planned catchment management. For the same reason, water demands of various water users can not be looked at separately. Having this in mind, an integrated water management is undertaken. Integrated approach to water management calls for a combined treatment of water quantity and quality

and for considering all water users including forests and other elements of natural environment.

All these determinants allow for the assumption that basic tasks of water management in agricultural catchments should involve:

Protection of water resources. Water resources in agricultural and forested areas are formed from atmospheric precipitation. Therefore, protection of their quality and quantity is decisive for water availability within the boundaries of larger catchments. Protection means creation of water resources through e.g. increasing potential retention capacity of the catchment or technical measures of the surface and ground water storage. It means also all actions for protecting water quality through limiting the dispersal of pollutants, diffuse pollutants of agricultural origin included. Special attention should be given the sensitive areas, according the Nitrate Directive (91/676/EEC of 12.12.1991).

Protection of natural values. The demands addressed at water management for creating conditions for sustainable development of rural areas and particularly of compromising the interests of agriculture and natural environment tend to increase. The aims of water management encompass creating appropriate conditions for maintaining biodiversity of agricultural landscape and for protecting areas of high natural values. This refers particularly to wetlands and meandering rivers. Meandering rivers belong to the most valuable and rare systems on Polish and European scale. Wet meadows, rare in Europe, are still well preserved in Poland as a result of small-scale agriculture. Extensive areas have been recognised as valuable and are specially protected. Figure 1 presents a general map of



Figure 1. Protected areas
1 – areas protected for their natural values, 2 – areas of the ground water recharge

protected areas in Poland. These are national parks, areas of protected landscape and other forms of nature protection. The location of infiltration areas, on which main reservoirs of ground water are recharged, is also given. On all these areas agriculture is somehow restricted and water management assumes particular importance.

Meeting economic needs. This notion means all activities focused on creating optimum water content (irrigation, draining) for agricultural and forest production, preventing from floods and droughts and supplying rural settlements with water for municipal needs and breeding. Water use for recreation, tourism, filling fish ponds, production of energy etc. also falls within this category.

Agriculture and environment

Activities focused on improving rural environment including water resources require first of all to define precisely the role of agriculture in the natural environment and to define mutual relationships, both positive and negative, between the two. Agriculture, and in particular its intensive form pose a threat to water resources, to flora and fauna. Up to date experience shows that the main risk in Poland pertains to:

Water quality: it is commonly agreed that agriculture results in pollution of the ground and surface waters due to excessive use of mineral fertilizers and plant protection chemicals (Kajak 1998). Draining systems increase the loads of outflowing pollutants. It is estimated that, in spite of low rates of fertiliser use in Poland (below 80 kg N/ha), 50% of the nitrogen and phosphorus load released to rivers originates from agricultural production (diffuse sources). An especially high pollution was found in shallow farm wells, being an effect of improper fertiliser and sewage handling (*Ochrona środowiska* 2001). Fertiliser use on croplands is a less important source of pollution. It is commonly believed that with proper fertiliser application and after construction of sewage treatment plants and manure heaps this unfavourable effect of agriculture can be restricted.

Water quantity: agriculture is an important consumer of water and certainly affects water budgets of the river catchments. Water uptake for irrigation in Poland is relatively small (less than 15% of the total uptake for economic purposes). It is estimated, however, that intensification of agriculture (yield increase), even in non-irrigated areas, has affected the water budget. Increased water consumption is observed not only on irrigated objects but also in areas, where agriculture relies on rainfall. Increased yields (twofold in the last 20 years) should have as effect increased evapotranspiration. There is no detailed evidence on how rainfed agriculture contributes to the decrease of water flow in rivers or to the decline of the groundwater table. High natural variability of water flows in rivers and its dependence on many factors make the assessment of agricultural impact on water relations difficult. Nonetheless, many authors (Dynowska 1993; Kunkel and Wenland 2001; Mioduszcwski 1999; Querner et.

al. 1997) speculated that the increase of yields in the last 30 years could diminish the outflow from agricultural catchments by 8–50 mm annually.

Landscape: due to the fragmentation of farms (small-scale agriculture), Polish rural landscape is quite diversified and displays high biodiversity. Arable lands interspersed with grasslands, woodlots and shrubs form a mosaic of often high natural values. On the formerly large state farms this type of landscape has been mostly destroyed, as it was on large drained projects. Woodlots and shrubs were removed, small water holes were filled to provide extent flat areas available for intensive agricultural production. Such actions resulted in unfavourable transformations of these areas. Many ecologists are of the opinion that monocultures formed on large grounds are detrimental not only to the environment but also to agriculture itself. Large-scale agriculture based on monocultures unfavourably affects flora, fauna and water resources. Most specialists are convinced that levelling of surface, liquidation of shrubs etc. accelerates water surface runoff, decreases recharge of groundwater resources and thus interferes with the total water balance (Dynowska 1993; Radwan, Lorkiewicz 2001).

Wetland flora and fauna: wetlands are valuable nature areas and thus are protected all over the world. In Poland, 80% of wetlands were drained and transformed into meadows and pastures. Moreover, 60% of rivers and small streams were regulated. Replacing natural wetland vegetation with grasses, straightening and forming river channels markedly altered natural conditions of wetlands. Intensively agriculturally managed rivers and river valleys are poor from the point of view of nature. The situation was somewhat different in the valleys, where agriculture had an extensive character i.e. meadows were mowed once a year, very often manually until the most recent period. Valuable ecosystems of high biodiversity developed there. Some of the cultivated grasslands are the most important bird refuges. Areas abandoned by farmers quickly overgrow with shrubs and common reed and lose their assumed nature value. The example of the floodplain meadows is worth emphasising since in this particular case farming formed a valuable ecosystem, whose maintenance depends on periodical mowing. One may suspect that there are other examples demonstrating the role of agriculture in development of valuable ecosystems.

Transformation of Polish agriculture (through a decrease in the number of employed people, enlargement of farms and their mechanization, and improvement of living standards) is unavoidable. Problems of water and environmental protection play a significant role here. There is a justified concern that field consolidation may impoverish the agricultural landscape and decrease its biodiversity. Intensification of agriculture, on the other hand, may result in excessive water consumption. Finding appropriate ways for the development of agriculture, which should be effective and competitive, while protecting natural resources (including water resources) is a difficult task addressed to the whole nation but especially to specialists in water management, agriculture and natural environment.

Irrigation and drainage in Poland

The first hydraulic works for agricultural purposes were undertaken in Poland in the Middle Ages. The embankments were built to protect the lowland areas against flooding and some ditches were constructed to remove water from swampy areas. But the biggest area was drained after the World War II. More than 200,000 hectares of agricultural land were drained annually during some years, as shown in Table 1. Nowadays, 36.2% of agricultural land (18% of the whole country) are equipped with different kinds of drainage systems, and only some have irrigation systems. Most peatlands (wetlands) were drained and turned into grassland.

Table 1. The average area drained annually in Poland

Years	The area drained [hectares per year]
1951–1955	95 000
1956–1960	102 000
1961–1965	245 000
1966–1970	260 000
1971–1975	205 000
1976–1980	120 000
1981–1985	72 000
1986–1990	102 000
1991–1995	20 000
1995–2000	11 000

Source: *Ochrona środowiska (Environmental protection)*, 2001, Główny Urząd Statystyczny, Warszawa.

After 1990 drainage works on new lands have practically been abandoned. Not more than 3000 hectares of arable land are drained annually now. Draining of river valleys stopped completely. Most of water engineering undertaken is connected now with the reconstruction of irrigation systems, and construction of water reservoirs or weirs to rise the water level in some rivers. Some of the hydrographic systems are going to be re-naturalised for wetland protection.

Anyway, it is necessary to stress that a large area of agricultural land in Poland is equipped now with hydraulic structures mainly for soil dewatering. As can be seen from Table 2, most of the agricultural land is drained without the possibility of irrigation. Covered plastic or ceramic drainage networks were constructed for dewatering arable soils. Irrigation systems were built mainly in orchards and vegetable gardens. Grasslands situated mainly in river valleys were drained by open ditches. Some 25% of the drained grasslands can potentially be irrigated. Gravitational irrigation (regulation of water table in the ditches) is the only method used for irrigation of grasslands.

Table 2. Specification of the land reclamation structures

Land reclamation area and structures	Units	Amount
Area with drainage system	'000 hectares	6 690
• Arable lands	'000 hectares	4 725
• Grasslands	'000 hectares	1 965
Irrigated area	'000 hectares	480
• arable lands	'000 hectares	62
• grasslands	'000 hectares	418
Hydraulic structures managed by farmers		
• ditches and small water courses	Km	283 746
• pipes (without sprinkler irrigation)	Km	8 211
Hydraulic structures managed by the State for farming purposes		
• regulated rivers and canals	Km	49 588
• non-regulated rivers	Km	24 796
• levees (embankments)	Km	8 371
• area protected by flood control works	'000 hectares	1 200
• pumping station	number/m ³ ·sec ⁻¹	592/170
• water reservoirs	number/10 ⁶ m ³	185/170

Source: Ministry of Agriculture and Rural Development.

The numbers shown in Table 2 represent the totality of works carried out in the years 1950–1990. Large areas were reclaimed in those years in now non-existing large state farms. Many farmers from smaller farms also postponed conservation and utilisation of the irrigation and draining systems for economic reasons. Thus, the huge potential is presently used to a small extent. Only 20% of water facilities are estimated to be now in the state enabling their effective use for agricultural production. The extent of irrigation in the year 2002 is shown in Table 3.

Table 3. The extent of irrigation

Type of irrigation	Irrigated area		Volume of water	
	[ha]	%	Dam ³	%
Sub-irrigation (upstream control)	94 370	95.24	109 246	97.05
Sprinkler	4 458	4.50	2 594	2.30
Surface (floods)	241	0.24	671	0.60
Furrow	20	0.02	50	0.05
Total	99 089	100.00	112 561	100.00

Source: *Ochrona środowiska (Environmental protection)*, 2001, Główny Urząd Statystyczny, Warszawa.

It is worth emphasising that the reclamation facilities in Poland have a specific character, markedly different from those of other European countries. Two types of systems are distinguished:

- Typical drainage projects made of covered ceramic drains or perforated plastic tubes. Drainage facilities were mainly constructed on arable lands. To enable gravitational outflow of water, small watercourses were sometimes

regulated. The regulation consisted in deepening and broadening of the stream channel and in straightening its course. Sometimes, irrespectively of draining, sprinkling irrigation was performed there.

- Reclamation projects made in the river valleys. Basic draining facilities were the open ditches often combined with the regulated river. Such objects were usually designed to drain grasslands. On 30% of the area of these projects, hydraulic structures were built to enable water regulation through the so-called sub-irrigation, which consisted in delivering water from the river to the ditches and in maintaining its high level there. Another applied method was to regulate the outflow of water from the existing drainage network in spring i.e. to retard snow-melt waters there (regulation with the upstream control). Both these methods are ineffective, require a large number of structures, frequent mowing of the ditches and moreover, are associated with large, non-productive water losses.

During the last years some agricultural lands equipped with the draining systems have been abandoned for various reasons. The question is – what to do with this land, especially with open ditches constructed on peatlands. It is a complicated problem from the economic and ecological points of view. For example, some of these areas should be used for extensive agriculture to maintain their high natural values (Radwan and Lorkiewicz 2001).

In order to protect water resources and to provide adequate amounts of water for plant production it is necessary to implement new methods of management and maintenance of the reclamation systems. This means mainly the installation of such facilities on the draining network that would enable controlled water outflow (Mioduszewski 1996; Querner et al. 1997). Common use of this method may decrease high water flows, may fulfil plant requirements for water and improve the surface and ground water quality.

Ecological methods of improving the water balance

The extreme weather phenomena and the resulting floods or dry periods with small precipitation and low river water flows are all natural. Moreover, periodical flooding of the river valley is often a prerequisite for maintaining natural equilibrium. We may think of threats only when such extreme phenomena exert a negative effect on human economic activity. Only in relation to this activity one may consider the excess or the deficit of water. In other words, “natural extreme phenomena” become “natural threats” in case when they negatively affect human activity and bring accountable losses.

Having this in mind, we may distinguish two groups of methods for protection and prevention against these threats:

- to adapt extreme phenomena to human needs i.e. to free from variable natural conditions; technical solutions like flood control dikes, water reservoirs, reclamation systems play a decisive role here,

- to adapt human activity to natural phenomena i.e. to develop such land management and utilization as to minimise the negative impacts on life and economic activity of man.

To meet the requirements of sustainable development, more attention should be paid to the second method. This is especially valid for agriculture and water management.

Restoration of water retention in a catchment seems to be the most environment-friendly and to fulfil the best the requirements of sustainable development among all methods of improving water balance and counteracting natural threats (Mioduszewski 1999). It should be stressed, however, that with the present status of management in catchments and river valleys and high population densities, implementation of this method seems to be rather difficult in some areas. Regardless of the way and intensity of economic land use (including croplands) one has to retard the rapid outflow of snow melt and precipitation water, which means restoration of the natural retention capacity of the river catchment.

Improving water balance with technical methods means a possibility of decreasing high floodwater stages and increasing low discharges in rivers. This is equivalent to the increase of surface water resources. Less attention is paid, however, to the possibility of increasing the effective infiltration (recharge of aquifers), which increases the ground water resources. Resources of water in the aeration zone of soils are not mentioned at all.

Ecological methods of affecting water balance in small catchments consist in impeding the turnover of water through the retention of surface waters, soil water and ground waters. In that way one increases the retention of the whole catchment. Three types of actions aimed at improving water balance can be distinguished: technical, planning and agrotechnical.

Technical. Most hydrotechnical and reclamation works undertaken to inhibit the outflow of surface waters fall within this category, which includes, in particular:

- retention of surface waters through construction of small water reservoirs, lifting the water tables in lakes, water courses, ditches and channels (channel retention),
- regulated water outflow from the draining systems and from the network of draining ditches, and proper management of water reservoirs,
- increase of recharge of groundwater reservoirs through construction of ponds and infiltration wells, management of runoff from waterproof surfaces (roofs, streets, squares) to enable water infiltration on permeable grounds (Geiger and Dreiseite 1999).

Planning. Appropriate spatial planning may play a role in water management. This role may consist in creating such a spatial organisation as to prevent rapid outflow of rainfall and snow melt waters. The actions should involve:

- shaping an appropriate setting of arable lands, grasslands and forests (maintenance of the mosaic character of landscape),

- constructing protective plant strips (shrubs, trees), restoration of possibly numerous areas of ecological use,
- establishing the areas of ground water recharge and their proper management,
- identifying the areas vulnerable to agricultural diffuse pollution and implementing proper methods of cultivation,
- reconstructing and preserving wetlands and peatlands, maintaining grassland management in the river valleys.

Agrotechnical. Appropriate agrotechnical methods (*Polski Kodeks...* 1999) may improve water quality and increase water quantity. Basic actions within this group include:

- increase of the soil retention through improvement of soil structure and increase of humus content in soils; this goal is usually achieved by proper ploughing, agro-reclamation measures, fertiliser application and liming,
- restriction of the surface runoff by counter-erosion measures and aftercrops,
- decreasing evapotranspiration through proper plant selection and restriction of evaporation from the soil surface.

Actions aimed at the increase of retention capacity can also be shown in terms of the medium, in which water is to be stored. One may thus distinguish landscape, soil, ground water and surface water retention (Table 4).

Table 4. Systems of water retention in rural areas

Water resources	Systems
Landscape (habitat) retention	Systems creating appropriate land use structure through the set up of arable lands, grasslands, forests, areas of ecological use, water holes
Soil retention	Crop systems affecting water management in soil profile, particularly the increase of potential water retention in soils
Ground waters	Cultivation and reclamation systems to decrease surface runoff and increase the recharge of ground water reservoirs
Surface waters	Hydrotechnical water distribution and management systems including construction of small reservoirs, outflow control from drainage systems

Measures proposed to improve the retention capacity of the catchment do not introduce significant changes in the natural water regime but only bring necessary corrections in water balance in such a way so as not to disturb the biological equilibrium of the ecosystem. Pro-ecological actions of stimulating small retention may to a degree help recreating (restoring) some elements of the water system disrupted by the human economic activity to date.

Actions undertaken to implement the ecological system of water management in rural areas

The calculations and analyses performed demonstrate that the actions here presented may be important for proper formation of the water balance structure

(Graham and Lest 1995; Kowalewski 1998; Kunkel and Wenland 2001; Mekotova and Sterba 2001; Mioduszewski 1996, 1999; Szymczak and Kowalewski 1999). Water harvesting as a method of improving agricultural water supply has a long tradition in tropical regions and is recognised to be the most natural method of satisfying agricultural water demand. The analyses show also that under the temperate European climatic conditions the methods similar to water harvesting may be efficiently used as the basic measure to improve water balance (restriction of harmful flood waters and the increase of low flows) and to protect the quality and quantity of surface and ground waters.

Actions meant to improve the structure of water balance on agricultural lands are undertaken in Poland, though on a small scale. Some of them may be prescribed within the ecological system of water management in rural areas, in spite of the fact that they have been undertaken for other purposes than water protection. Nonetheless, indirectly or directly they affect water cycle in nature. The ecological system of water management consists in:

- Elaboration and implementation of the “Code of good agricultural practice” (*Polski Kodeks* 1999). The code contains detailed actions aimed to limit emissions of nutrients and plant protection chemicals to surface and ground waters. Courses and trainings for farmers are organised by Agricultural Advisory Centres. A few demonstration farms are also organised in various regions of the country to implement suitable methods of storage of organic fertilisers. These actions are not common yet, nevertheless they are expected to bring definite beneficial effects. The “Code...” elaborated in Poland pays little attention to the problem of water quantity, to erosion, development of agricultural landscape or management of the draining and irrigating systems. It seems that the “Code...” should be supplemented with topics concerning water protection and management of irrigation-drainage systems.
- Problems associated with the protection of water quantity have been reflected in the agreement signed on 11th April 2002 by the Minister of Environment, Minister of Agriculture and Rural Development, President of the Agency for Restructuring and Modernisation of Agriculture and President of the National Fund for Environmental Protection and Water Management concerning the development of small retention. Small retention is meant here as all actions undertaken to limit the outflow of precipitation waters from the small river basins. The actions fall within the scope of „water conservation” and „water harvesting”. They encompass small reservoirs (of a volume less than 10^6 m³) and ponds, rising water level in rivers and channels by construction of hydraulic structures, but also modernisation of draining systems to enable the regulation of water outflow. The agreement was signed in view of improving water balance in small catchments for the needs of agriculture and improvement of natural values of rural areas. The parties to the agreement took the responsibility of supporting any action associated with improvement of the catchment retention capacity. Moreover, two institutions, namely the Agency for Restructuring and Modernisation of

Agriculture and the National Fund for Environmental Protection and Water Management took obligation of supporting some of these actions financially. The map of small retention priorities has been elaborated (Figure 2). This map was the basis for distribution of financial support for water investments. It is estimated that an additional retention of 20 million m³ will be formed annually within the project. The retention will consist of small water reservoirs built for recreational purposes, fish ponds and the elevation of water level in lakes. Facilities for water lifting in rivers and channels will be of lesser importance.

- A fund to support some environmental actions in agriculture has been established in the framework of preparations of Poland to the access to EU. Financial support from the programme called “agro-environmental fund” will be addressed to farmers who take the obligation of conforming to some agricultural technologies like decreased fertiliser use, restricted mowing of meadows in the period of bird hatching etc. The rules of distribution of financial aid are now being elaborated. Agro-environmental schemes are exclusively focusing on biodiversity and landscape protection of rural areas. The ways and scopes of financing specific agricultural technologies to improve water quality and increase its volume are under discussion.



Figure 2. Priorities for small retention investment projects
1 – high priority, 2 – medium, 3 – low, 4 – mountain areas

- Minister of Environment can establish a protected forest, playing protective role for surface and ground waters. Special regulations of management approved by the Minister of Environment apply to these forests. Afforestation of the former croplands is a separate problem. It is estimated that over two million hectares of the presently utilised croplands should be forested. The act of Polish parliament obliges local authorities to pay financial equivalents to farmers for afforestation of croplands. The increase of the forest cover may result in significant changes in the water balance of some small catchments. Afforestation of poorly permeable loamy grounds, particularly those situated in the watersheds may result in moderating water flows in rivers (decreasing floodwaters and increasing low flows). Planting forests on sandy grounds, the areas of infiltration, may on the other hand unfavourably diminish the volume of water in aquifers.
- Development of protected areas like national parks, landscape parks, natural reserves or areas of ecological use. Sometimes protected areas include privately owned grounds. In such cases cooperation between the manager of a protected area and a farmer is required. In particular, a large part of legally protected wetlands (wet meadows) are the farmers' private property. Sometimes it is necessary to motivate farmers to at least extensive utilisation of such grounds to prevent expansion of shrubs and reeds. In most cases the establishment of protected areas, extensive agricultural land management, and protection of natural river valleys and wetlands contribute to improvement of the structure of water balance.
- Education is one of the most important factors decisive for the success of actions within the scope of „water, agriculture, environment“. The proper methods of management should be demonstrated to farmers. Such training has recently been developed in the agricultural advisory centres. The courses are, however, restricted to agrotechnical measures and problems associated with protection of water quality. Proper management of draining and irrigation systems, methods of water retention and saving obtain there much less attention. It was an initiative of the Ministry of Environment, resulting from the discussions conducted to elaborate a manual on water retention (water harvesting) and to organise training courses for farmers in various parts of the country.

Conclusions

The role of agriculture is not limited to production of food. It is also necessary to envision and define “the public function of agriculture”. The public function is to protect biological diversity and high value of the present cultural landscape. From this point of view there is a need to define new functions of water management in agricultural landscape.

Water management in rural areas in this novel approach encompasses complex technical, planning and agricultural actions. They all aim at protecting water

quality and improving the structure of water balance in the river valleys through restoration and increase of their potential retention capacity. The so-called small retention (water harvesting) focused on increasing the resources of surface, ground and soil waters plays a great role here.

The positive effect of increasing the retention capacity of small catchments on water quality and water balance is widely accepted. Numerical assessment of the undertaken actions is, however, very difficult. It often results from a lack of adequate knowledge and from complicated and complex relationships between physical and biotic catchment parameters and the processes of surface and ground water flow.

Water management in rural areas should be considered in economic decision making and planning of rural development. Particularly important is the consideration of these determinants of economic growth, which originate from the availability of water resources (water quantity and quality) in the local spatial planning. Water should be one of the elements decisive for the directions of agricultural restructuring, for recommendations formulated in the Code of good agricultural practice, plans of afforestation of former croplands, land use in the river valleys and infiltration areas, from which aquifers are recharged.

Basic and urgent tasks, which need to be accomplished in order to improve water balance are:

- continuation of the programme of small retention – construction of reservoirs and rising of water levels in eroded water courses,
- implementation of proper exploitation methods of the irrigation-drainage systems, the equipment of drainage systems with facilities to control water outflow,
- protection of the infiltration areas (to increase recharge of ground water reservoirs),
- obligatory introduction of water issues (protection of water quality and quantity) into local spatial planning,
- elaboration of the restitution programme for wetlands, water holes, small lakes etc.,
- liquidation of water outflow from the draining systems on abandoned meadows, river restoration and recovery of the natural meandering of water courses.

To sum up, water management in small rural catchments can be a fundamental element decisive for water resources in the country. Hence, the necessity of appropriate and complex management of these resources should be stressed. Water management plans (water use conditions) should consider not only the technical (hydrotechnical, reclamation) activities but also all those planning, agricultural and natural factors, which might affect water balance.

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Distribution of income in Polish agriculture

Abstract: *During the transition period Poland achieved a rather quick rate of economic growth, exceeding 4.9% per annum. Inflation rate significantly decreased, even below the level observed in many EU countries. However, there were not only successes. Poland has reported very high, growing unemployment rate, beyond 20% of active labour force. Growth of the unemployment, in both rural and urban areas, is the main issue to be solved. Another important “hot” issue is income distribution. The period of economic transition in the post-communist countries, including Poland, brought about a considerable increase of income differentiation of the society. This differentiation applied to a greater extent to agriculture and rural population than to non-agricultural and urban population. In 1984 the Gini coefficient for all households was 0.240, but by 1998 it rose to 0.312 and for farmers these numbers were, respectively: 0.362 and 0.449.*

Key words: *transition, parity, income distribution, Polish farmers*

Background

The period of economic transformation in post-communist countries, including Poland, brought about a considerable increase of income diversification of the society. It is interesting that this diversification applied to a greater extent to agriculture and rural population than to non-agricultural and urban population (Klank 2000). It brought about such phenomena as poverty and unemployment, as well, which were not reported in the official statistics in the pre-transformation period. Branko Milanovic from the World Bank in the preface to his book entitled “*Income, Inequality and Poverty during the Transition from Planned to Market Economy*” writes: *This is indeed a period of turmoil – comparable with the period that followed both world wars. It is the period of dramatic declines in income (in the first years of transformation – L.K.), reappearance of diseases long forgotten, growing poverty and unemployment, and great uncertainty. But it is also a period when great fortunes are being made...* (Milanovic 1998). He put very important questions, like:

- What was the influence of economic growth on socio-economic groups?
- Who benefited from the growth and who lost?

Why answers to these questions are important? Although Milanovic's research refers to the initial stage of transformation (years 1989–1993) the questions are still valid. Situation has even worsened in some groups, for instance – in the rural society. There are also other reasons to answer these questions. Generally, income and wealth distribution issues have very long history. In Poland, as well, the questions of fair distribution of wealth have been intensively discussed for pretty long time. They have very important economic and political weight. Besides, agriculture and rural society in Poland are still significant both in economic and political terms. Rural areas cover 93% of Polish territory. Some 14.7 million people live there, equivalent to 38% of the total country's population. About 2/3 of rural areas is involved in agricultural production and 50% of rural families are farmers. At the same time, we face the fact that only 8% of population involved in agricultural production gains income solely from agriculture. For the remaining 9.2 million people, agricultural activity is only an additional source of income. Pension transfers dominate in the structure of incomes of the rural population, which causes certain consequences for agricultural policy of the state.

Farms in Poland are characterized by a considerable diversification from the point of view of production situation and incomes. About 13% of 2 million farm families produce solely for their own needs. Only 37% of farms sell their produce mostly at the market place¹. The average value of this produce amounted to 1200 zlotys (about 300 US dollars) annually, i.e. 100 zlotys monthly (25–30 US dollars) per farm. Then, 2.5% of farms do not produce at all. Therefore, more than a half (52%) of farms are a so-called subsistence farm. It is therefore difficult to expect that they see their future in development of their farms.

There is also another question, which has to be considered. All the countries of Central and Eastern Europe (CEE) have been changing all the spheres of their economic, social and political life. There is no single theory, which satisfactorily explains how to adjust the “centrally planned society” to the modern, information and market society. After almost 15 years of transformation and growing political tensions we can say that the existing development theories do not help much in solving general issues such as growth, equality and justice.

This paper tries to answer one of the above questions.

Methodology

The data sources and the income concept used

Only one basic source of data was used, the Household Budget Surveys for selected years. This source of data is based on the sampling method, which allows for the generalisation of the results to the whole population of households. Before 1982 the household budget surveys were carried out with the con-

¹ Agricultural Census 1996, Central Statistical Office, GUS, Warszawa 2000.

tinuous method, according to which the same sample of households was followed in the survey for a year or longer. Since 1993 the monthly rotation method has been used. The surveys are carried out by the respective statistical offices. Every year they collect the data from roughly 32 000 dwellings.

The household's disposable income was used as a measure of income. It comprises, among others,

- income from hired work,
- income from individual farm, of at least one hectare of area,
- income from self-employment outside the farm,
- income from free professions,
- income from property,
- social insurance benefits,
- other social benefits,
- other income.

In our study this category of income, calculated per capita, is used both for income parity measure and income distribution (differentiation).

Methodology of assessing income distribution

The most common procedure for presenting income distribution data refers to the cumulative decile tables or their graphical counterpart, the Lorenz curves. Since the cumulative tables contain all the information provided by Lorenz curves the tables alone are used in the presentation. There are a number of statistics, used to measure income concentration or income inequality. The most popular one is the Gini coefficient, which is used in this study. The Gini coefficients are calculated from the discrete (individual) data. It is well known that 0 and 1 bound the Gini coefficient, implying, respectively: complete equality and inequality.

Discussion and results

Income parity as a goal of agricultural policy

Agriculture has always been a very sensitive political issue in all communist countries, including Poland. The agricultural issue was even more important in Poland than in other communist countries, because the largest private sector among all communist countries was in Polish agriculture. Farmers had real political power. All the major political changes in Poland after World War II were connected, directly or indirectly, with food and agriculture. The problems, which arose in feeding the nation in the years of crisis, forced subsequent governments to modify the goals of their agricultural policy.

Until 1980, the principal goal of agricultural policy in Poland was to achieve the highest possible rate of farm output growth. After 1980, this goal was changed to achieving self-sufficiency in farm and food products. After 1989, the main goal of agricultural policy was changed again, this time to provide off-farm

employment for farmers and rural people. During this entire period farmers' incomes were the most important issue both for farmers and decision-makers. Both farmers and politicians believed that by solving the income issue, they could solve all other problems associated with the sector.

Principles of income policies

For many decades farmers and politicians, acting as their representatives, have been calling for farmers' incomes to be equal to those of other social groups. The demand to earn equal incomes is based on the concept of equal opportunities for all social and occupational groups and was heard already before the World War II. In Poland it also had a very strong religious and ideological background. The concept was referred to as parity.

This concept became the foundation of one of the most fundamental principles of income policy in agriculture. It was defined for the first time in the USA in 1933 legislation as a way to measure prices that would provide farmers with a 'fair' income. In fact, it was not a measure of income parity but, by virtue of definition, of parity prices.

Leaving aside the issue of achieving the goal of parity prices, let us indicate that it in fact meant that the goal became one of having incomes of farmers and non-farmers increase at the same rate. It was a major contribution to the process of defining income principles for agriculture in many advanced industrial countries, as well as in Poland.

Over time there was an evolution from the principle of parity prices to the principle of equal living conditions for farmers and non-farmers. Thus, the history of agricultural income policy in advanced industrial countries saw three goals of income policy, namely:

- 1) a goal of stable price ratios for farm products fixed at some historical period,
- 2) a goal of parity incomes, that is an equal level of incomes,
- 3) a goal of parity living conditions, that is of equal living standards for different social and occupational groups.

However, there is a possible fourth option, namely – no income policy.

Most developed, industrial countries, as well as Poland, tried to implement their income policies for agriculture using the changing objectives. Poland, for instance, adopted two principles of income policies for agriculture, especially towards private farmers (for the state farms and later on also for the farming co-operatives the principles of income policies were similar to those in industrial state enterprises). In 1956, the so-called new agricultural policy introduced the principle of equal rate of growth of incomes for farm and non-farm households. At that time the ratio of a farmer's income to that of a full-time employee in other sectors of the economy amounted to 75%. It is obvious that that principle would have maintained relative differences in incomes and lead to increases in absolute differences in incomes. Farmers would be at a disadvantage from the

beginning. But, in fact, their incomes increased much faster than non-farmers' incomes. Until 1981, when the principle of equal rate of growth of incomes was replaced by another concept, the relation between incomes of the two groups was much higher than at the beginning. Even in 1980, which were a very bad year for Polish agriculture due to bad crops, the relation of farm to non-farm income was equal to 84.2%, and in 1978-79 it amounted to 90 and 93%, respectively. Between 1981 and 1984, the relative incomes of farm population were near parity, that is, the relation between incomes of farmers and non-farmers was almost equal to one. One has to remember that in these calculations off-farm incomes were not taken into account.

In introducing the parity income formula for agriculture, Polish politicians believed that:

- It would be the best measure of the income situation of farm households.
- By achieving the parity of incomes, food shortage issues would be solved. As a result of the latter, the political tensions would be eliminated.

The early 1980s brought essential changes in income policy in Poland towards private farms. The principle of equal rate of income growth was replaced by the principle of parity of incomes, which meant equal incomes for farmers and non-farmers. Thus, this principle was very similar to the one followed by the EEC. The adoption of parity income policy in 1981 in Poland was not successful. It was introduced together with a policy of increasing prices at the time of severe decline in the production of agricultural products and chaos on the market. The decision to implement the principle was both economic and political. With this move politicians hoped to bring about an increase in the scope and volume of agricultural production. However, at that time, as well as in 1982, there was no longer any connection between prices and goods on the market. The purchase price of agricultural products increased by 67%, whereas the price of consumer goods for farmers increased only by 28%. This caused farmers' incomes to rise above parity. The relation of income for consumption in a farm household to that of a full-time employee in a non-farm household was at 90% in 1981. In the following year it increased to 106%, and in 1983 it amounted to 99%. Since 1983, the gap between the incomes of farmers and non-farmers has been increasing. In 1989, the relation mentioned was at around 84%. In August 1989, the government formally stopped following the principle of parity incomes. The introduction of market prices, as demanded by farmers, resulted in a rise in incomes for a short period.

In the last quarter of 1989 the nominal income per head of population in a farm household was 33% higher than in non-farm households. This situation did not last for long, and in the second quarter of 1991, farmers' incomes were at the bottom in comparison to other social and occupational groups in Poland. In 1994 and 1995, the ratio of farmers' to non-farmers' incomes was 87.6% and 91.3%, respectively. On the whole, the new economic policy did not provide any income policy for agriculture. The agricultural policy was based on the principles of market economy.

Parity and economic development

The previous discussion shows that income parity may be defined in a number of different ways; moreover we can measure it using various methods. J.R. Bellerby was one of the pioneers of the scholarly work in this area. (Bellerby 1956). Before World War II he measured relations between incomes in twenty countries using the concept of the ratio of the farmers' incentive income. According to his definition, the income ratio is the relation between the incentive income per full time employment equivalent in agriculture and the incentive income per person employed in other sectors of the economy. Incentive income meant the return for the worker's effort and his undertaking. In agriculture this was defined as the total factor income after the deduction of the net rent, interest costs and wages paid to agricultural workers.

Bellerby's research on the incentive income ratios in the agriculture of Great Britain during the periods of 1867–69, 1911–14, 1923–29 and 1936–38 showed a very big difference in this ratio in the periods considered. In fact, the income incentive ratio was up from 35.5% in 1892–96 to 81.1% in 1933–1935. In 1938, Bellerby reported his first international research using 28 countries. On the basis of his research, he claimed that there was no positive correlation between the level of economic development and relative incomes of farm households.

Bellerby's research relates to the first half of the twentieth century. We follow Bellerby's research by using FAO data and the respective formula, which is the ratio of the share of the agricultural GDP to the share of the GDP of other economic sectors divided by the ratio of agricultural population to non-agricultural population. On the basis of the analysis of the data we could conclude that the income parity was incidental and was the result of some specific social, economic and political conditions (Klank 1997, 55). Thus, instead of using term "parity" we suggest to use the term "relative incomes".

The correlation coefficients between the per capita GDP and the relative incomes have been calculated for 1961 and 1980 and were, respectively: 0,663 and 0,464. They turned out to be statistically significant with a very high probability level: $p = 0.999$. These results demonstrate that the relative incomes and the economic growth are not highly correlated.

The subsequent analysis examined the correlation between economic growth and the changes in the farmers' relative incomes. In other words, does economic growth produce income parity between the farm households and the non-farm households? Based on the same FAO statistical data for 1961 and 1980, correlation was calculated between two variables: a) the rate of economic growth, measured as increase in per capita GDP; and b) the increase in relative incomes, defined as point difference between the periods analysed. It should be remembered that we have taken into account only agricultural incomes, i.e. derived from agricultural activity (production).

The coefficient of correlation between the two factors amounted to $r = -0.103$ and turned out to be not statistically significant. In other words, there is very weak correlation between economic growth and the increase in the relative income of the farm households. Many scientists, including E.O. Heady, claimed that the economic growth even worsens the relative economic position of farm households (Heady and Whiting 1975).

This assertion may be correct, but it is the relative income that declines and not the absolute income level. Economic growth produces income increases for all social groups, but not at the same rate. Income of farmers derived from agricultural production may grow slower than incomes of the other social and occupational groups. Our analysis shows this as a general tendency all over the world. However, the opposite tendency can be observed in some countries. So, what was the situation in the case of Poland? In the transformation period, and especially in the years 1992–2000, Poland experienced very quick economic development. In that period the average GDP per capita growth rate was 4.9% per annum. It was even quicker in the second half of the 1990's than in the first half of the decade. The impact of such a rapid economic growth on incomes of farmers is presented in Table 1. Based on Table 1 we can conclude that in the years 1997 and 2000 relative incomes of farmers compared to all households were, respectively, 92.7% and 74.7% and compared to worker households, respectively 90.3% and 69.4%.

At the same time, relative incomes of part-time farmers were lower than that of farmers and were, respectively: 83.9% and 74.2% compared to all households and 81.8% and 73.6% if we compare them to worker households.

Generally, the so-called income disparity of Polish farmers, both full- and part-time was not dramatic. These ratios should be considered good, especially when we take into consideration relatively low labour productivity of Polish farmers. Additionally, they are comparable to the income situation of the 1970s and 1980s (Klank 1985).

Table 1. Monthly disposable personal income by socio-economic groups (in PLN/person)

Household	Year			
	1997	1998	1999	2000
Total of which:	473.8	522.9	560.6	610.5
Employees	486.4	546.4	592.1	657.3
Pensioners	n.a.	614.1	665.7	696.4
Self-employed	618.4	655.1	715.9	794.7
Disabled	494.6	452.7	483.7	494.9
Farmers	439.3	406.8	411.5	456.0
Part-time farmers	397.7	419.4	438.4	483.6

Source: Household Budget Survey, Central Statistical Office, GUS, Warszawa (selected years).

If so, why farmers do complain about their economic situation. The answer to this question is rather complex. There are different reasons, not only of economic nature. The most important reasons are, as follows:

- Nowadays, Polish farmers operate in a completely different economic environment than during the communist times. They operate under uncertainty. Agricultural prices are not fixed; they have difficulty in selling agricultural products; there is also a strong competition from the outside (import). Income policy of the state toward this group is unclear.
- Farmers' real disposable incomes derived from agricultural production significantly decreased. In the period of 1995–2000 they dropped by 50%. In the same time real disposable incomes of all households rose by 21.4%.
- Farmers have experienced growing differentiation of incomes and wealth not only between rural and urban people, among different socio-economic groups but among farmers, as well. More and more rural people live in real poverty.
- The composition of farmers' income has significantly changed. Contrary to the earlier periods (1960–1980) farmer families depend more and more on off-farm incomes, mostly transferred ones (in the form of pensions and other social payments).
- Rural areas do not depend on agricultural incomes, anymore. As we can see (Table 2) only roughly 16% of disposable income in rural areas comes from agriculture.

Table 2. Monthly disposable personal income by location and settlement size in 2000 (PLN/person)

Item	Number of inhabitants in a town (in '000)					Total	Villages
	Below 20	20–100	100–200	200–500	More than 500		
Income	572.2	623.9	684.9	730.5	935.1	695.0	483.0
	% of income derived from:						
Employment	50.4	51.9	52.8	51.3	54.4	52.3	37.6
Farm	2.1	0.5	0.2	0.2	0.2	0.6	15.7
Self-employment	9.1	8.7	9.6	11.9	12.0	10.2	5.2
Social payments	32.4	33.1	31.7	30.3	26.4	30.7	36.6
Property	0.2	0.2	0.1	0.5	0.7	0.3	0.1

Source: Own calculations based on the Central Statistical Office household survey.

- In the year 2000 the incomes of rural population were by more than 30% lower than those of the urbanites. This situation is not accepted by the rural society, consisting mostly of farmer families. We have to remember that there is a very difficult labour market situation in Poland. At the time of the survey quoted more than 3 million persons were officially registered as unemployed and the official unemployment rate was at 17.3%. Since that time the situation on the labour market even worsened. In practice, there are no new jobs for farmers.

There is another more general question related to income parity. Differences in incomes within agriculture raise doubts and questions regarding the principle of income parity. Hence the following question: does achieving income parity in agriculture mean equal incomes and equal satisfaction for all farmers? The answer is **no**, because:

- Farmers are usually not aware of what parity is. What they, in fact, want is not equal incomes, but maximum incomes. If they compare their situations with those of persons involved in other sectors of the economy, they compare living conditions and not incomes. It appears that the principle of parity has more importance to politicians than to farmers.
- The differences between incomes within agriculture are usually greater than in other sectors of the economy. In many countries a small percentage of farms have very high levels of production and incomes. In other words, the concentration of incomes within farming in these countries is very high. As a result, many farmers with lower incomes are not satisfied with their income situation, even though on the average the agricultural sector receives income parity. Thus, achieving parity has little to do with achieving equal incomes.
- Because of the difficulties in obtaining proper data on incomes, the income parity concept can be subject to political manipulations. In the 1980s, Poland experienced such manipulations.
- Implementation of the income policy that is based on a parity formula can be very expensive in case of very low efficiency in agriculture. In other words, achieving parity incomes will require large money transfers from (other) taxpayers or consumers to farmers.

Income differentiation

As we have mentioned above, during the transition period the differences in incomes and wealth jumped up in Poland. Between 1984 and 2000 an official growth of income differentiation for all households, measured by the Gini coefficient for those years was from 0.24 to 0.33. A faster growth of income differentiation for farmer households than for other socio-economic groups should not be a surprise. They were earlier also more differentiated than non-farmers. It is also important, that there are some state guarantees for wages (minimum wage) but no such guarantees for incomes of the self-employed persons and farmers. However, the tax system is very favourable for farmers. They pay so-called agricultural (land) tax, which is not bound directly with their incomes, and is generally very low. On the other hand, though, according to that tax system farmers are obliged to pay taxes even when they report losses. This system is very favourable especially for big farms. It must be added yet that the official income statistics show much lower differences than the actual ones. There are many farms (between 5% and 15%), featuring negative incomes, not included in the Gini coefficient calculation. The so-called “grey economy” is not included in the statistics, either.

Table 3. Gini coefficients by socio-economic groups in the years 1984–2000

Socio-economic group	1984	1997	1998	1999	2000
Total of which:	0.240	0.315	0.312	0.314	0.328
Employees	0.233	0.318	0.321	0.320	0.343
Part-time farmers	0.258	0.302	0.306	0.305	0.291
Farmers	0.362	0.481	0.449	0.455	0.466
Self-employed	n.a	0.377	0.371	0.349	0.364
Pensioners	n.a	n.a	0.219	0.226	0.235
Disabled	0.215	0.244	0.264	0.272	0.284

Source: for the year 1984: I.Topińska, M.Wiśniewski, 1996, *Zróżnicowanie zasobów oszczędnościowych*, Życie Gospodarcze, 11; for the period of 1997–2000, own calculations.

Additional conclusions can be drawn from income distribution presented by decile groups (Table 4). The data shows the strongest concentration of incomes in farm and self-employed households. About 50% of the total farmers' income is earned by 20% of farmers. In order to make incomes evenly (perfectly) distributed more than 1/3 of farmers' incomes should be moved to lower deciles, it means to poorer families. Income distribution by decile groups shows that not all farmers have lost during the transition period.

Table 4. Personal disposable income distribution by deciles and types of household in 1998

Deciles	Households of:						
	All	Employees	Part-time farmers	Farmers	Self-employed	Pensioners	Disabled
I	3.1	3.3	3.4	1.6	3.0	4.4	3.4
II	4.8	4.8	5.1	3.3	4.4	6.3	5.3
III	6.0	5.8	6.1	4.3	5.5	7.3	6.6
IV	7.1	6.8	7.0	5.3	6.9	8.1	7.7
V	8.1	7.8	8.0	6.4	7.1	8.9	8.7
VI	9.2	8.9	9.0	7.7	8.6	9.7	9.6
VII	10.5	10.2	10.3	9.6	9.8	10.6	10.8
VIII	12.1	11.9	11.9	11.9	11.6	11.8	12.4
IX	14.7	14.9	14.5	16.1	14.7	13.7	14.5
X	24.5	25.6	24.7	33.8	28.3	19.2	21.0

Source: see Table 1.

Poverty

When analysing income differentiation one cannot ignore the issue of poverty. Poverty is like the other side of the coin named wealth. Although poverty has definitely a relative meaning, it really exists among Polish families and households. The incidence of poverty varies across the different socio-economic groups and depending on the definitions used. According to the official, legal definition of poverty the number of persons living in poverty is relatively stable. In the period of 1997–2000 only 12.1–14.4% of population lived in the officially

defined poverty. Of course, it is usual for the governments to tend to ignore this “embarrassing” issue. But even if we limit ourselves to the official definition we can see that we talk about 4.7–5.7 million people. According to this definition, in 2000 the highest incidence of poverty was among social-income recipients (both unemployed and disabled) and farmers. There was almost no poverty among the white-collar families.

Yet, if we take into account the definition based on the social minimum criterion the relevant figures are much higher compared to the official definition. But the ranking of poverty households remains. About 54% of persons live below the social minimum level; for unemployed this percentage is the highest and then for farmers and workers. There is very strong link between education and poverty (Table 5).

Table 5. Persons living below poverty line in 2000 (by definition and level of education of the family head)

Education level	Definition of poverty line:			
	Social minimum	Biological minimum	Relative poverty line	Official poverty line
Total	53.8	8.1	17.1	13.6
University	14.8	0.3	1.2	0.8
Secondary	41.7	3.2	8.2	6.3
Vocational	64.9	9.4	20.9	16.2
Elementary and none	67.7	15.6	28.9	23.9

Source: see Table 1.

If we take as a measure education of the household head and poverty incidence we can observe very strong (inverse) relationship between them. This relation leads to the crucial conclusion that one of the ways to alleviate poverty is education.

Conclusions

During the transition period Poland’s economy has achieved rather fast rate of economic growth, exceeding 4.9% per annum. However, since 2001 Poland experiences economic stagnation. The period of economic transition in post-communist countries brought about a considerable increase of income differentiation of the society. This differentiation applied to a greater extent to farmers and rural population than to non-agricultural and urban population. The relative income situation of farmers compared to the non-farmer families, the so-called income parity, has worsened but not to a dramatic level. That was due to the growing contribution of the state budget to agriculture. Most state subsidies, i.e. more than 70%, are devoted to farmers’ income increase through the pension system. The constraints on the state budget do not allow for the continuation of such a policy.

During the transition the income differentiation of all households measured by the Gini coefficient jumped from 0.240 in 1984 to 0.328 in 2000. However, the Gini coefficient values for the same period for the full-time farmers were, respectively: 0.362 and 0.466. As it well known, if the Gini coefficient, generally contained between 0 and 1, decreases, there is diminishing inequality and vice versa, when its value grows up towards 1, we deal with an increase of inequality (differentiation). Thus, incomes of part-time farmers were less differentiated than those of full-time farmers. Distribution of incomes showed that all socio-economic groups benefited from economic growth. However, these benefits were not equally distributed within the groups. One of the most striking results of such unequal distribution is poverty, which is very high, especially in rural areas. Depending on the definition of poverty we can talk about 4.5–20.5 million people living in poor economic conditions. The problem is that there is no clear state policy towards that issue. One way to improve the situation in this area is education adjusted to labour market demand.

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The changes in and the spatial patterns of Polish agriculture

Abstract: *Although the contribution of agricultural production to national income decreased from 58% in 1947 to 3.3% in 2001, Polish agriculture still provides employment to roughly 20% of the total of persons employed in the country. Average size of individual farms increased from 7.2 hectares in 1990 to 8 hectares in 2001. The small acreage of private holdings is prevalent in the southern provinces of the country. Worsening of the profitability of agricultural production at the beginning of 1990s (the loss of eastern markets), liquidation of state farming, increase of fallow areas, and a marked fall of funds in farm investments entailed a collapse in crop production, in animal breeding (especially in cattle raising) and in agricultural production as a whole. Gross agricultural production showed in 2000 the decrease by 12.4% in comparison with its level in 1990.*

Key words: *agriculture, spatial differentiation, labour resources, agrarian structure, land and labour productivity.*

Introduction

The political changes in Poland taking place after 1989 have started a number of processes aiming at transition from the centrally controlled economy to the market economy. Furthermore, Poland belongs to the group of countries, which will become EU members in May 2004. Like the whole economy, Polish agriculture faces difficult problems resulting from the need of adopting it to integration with the structures of United Europe.

The statistical basis for the analysis here presented is constituted by the statistical data from agricultural censuses, general and branch agricultural statistical yearbooks and the publications devoted to the problem (Bański 2001; Kulikowski 2000, 2001; Niemczyk 2001; Orłowski 2001; Poczta, Wysocki 2002, *Polska Wieś* 2002; *Strefy ubóstwa...* 1998; Szafraniec 2001; Wawrzyniak 1999; Wilkin 2000; Woś 2001; Zegar 2001).

Contribution of agriculture to Polish economy

During the post-war period agriculture has long been an important division of Poland's economy. In the last years, though, its role is more significant in terms of the work place for a big number people, and less so as a component of GDP. The post-war period in Poland was characterised by vast structural changes of the income sources of rural population. In 1950 farming was the source of income for 73% of rural population, this proportion having declined to 27% by 1998. At the same time the proportion of the agricultural population receiving social benefits grew from 2% to 35% (retirement pays – 14.8% disability payments – 12.5%, unemployment and other social benefits – 7.7%, see Zegar 2001 and Niemczyk 2001).

Agricultural land occupied 54% of total Polish area in 2002 (16899.3 thousand hectares), the surface of agricultural land having declined since 1996 by 1439.9 thousand hectares (6.9%). More significant changes in land ownership have taken place in the 1950s, when the doctrine of socialisation was put to practice. This caused a rise in the share of the state and collective farming, blocking for many years the development of peasant agriculture. The transformation of the 1990s was characterised by two periods of deterioration of rural economy and macroeconomic conditions for agricultural production. First, the years: 1990–1995, was marked by the liquidation of state farms and rural trade co-operatives, worsening, first of all, the living standards of the former state farm workers. The second, from 1996 on, is characterised by the fact that the price ratio of agricultural products to the non-agricultural ones deteriorated visibly (Zegar 2001). At the beginning of the 1990s the efficiency of production factors in agriculture dropped significantly in comparison with other Polish economic sectors, what resulted in a serious reduction of incomes of agricultural population. In the years 1999–2000 the income of agricultural population, in comparison with the non-agricultural one, reached the lowest ratio during the whole post-war period. The parity indicator of agricultural income amounted to only 40% (Orłowski 2001). According to A. Woś (2001) the disposable gross revenues per person employed in agriculture constitute only 22% of those outside agriculture. In 1997 62.5% of total rural population lived below the social minimum, and 8.7% below the existential minimum (*Strefa ubóstwa...* 1998).

Polish food sector engages about 31% of total country's employment. Out of the total resources of labour in Polish agribusiness almost 88% is constituted by the persons employed in agriculture. At the same time agriculture has the shares of 34.6% in gross production and 27.7% in total investments in that sector (*Polska Wieś* 2002, diagram 3.1, p. 38).

Contribution of agriculture to national income has been decreasing from 58% in 1947 to 34% in 1960, 12% in 1989, and 3.3% in 2001 (Figure 1). This was largely due to the more dynamic growth of other branches of national economy and the collapse of agricultural production, connected with the liquidation of the state farms after 1991, the collective farming having dominated in some north-

ern and western areas of the country. The indicator of agriculture's share in national income varies across space from 1–2% in highly urbanised areas (the regions around Warsaw, Łódź and Katowice) up to 8% in the eastern part of the country (EU-15 – 1.7%, Germany – 0.8%, United Kingdom – 1%, France – 1.9%, Italy 2.7%, Greece 8%) (Pocza, Kołodziejczak 2002).

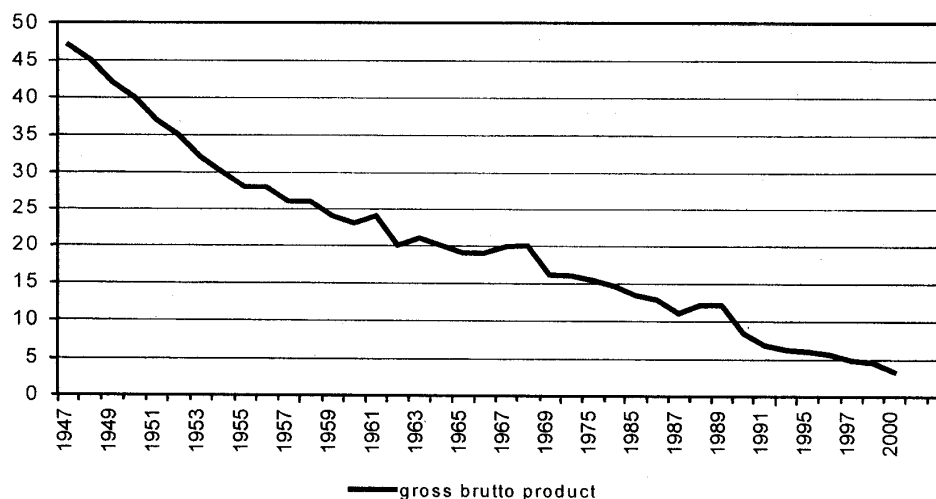


Figure 1. Percentage share of agriculture in total Polish gross brutto product

Employment in agriculture

Polish agriculture was engaging about $\frac{1}{5}$ of the total country's employment in 2001 (EU-15 – 5%, United Kingdom – 1.9%, Germany – 2.9%, France – 4.6%, Portugal – 13.3%, Greece – 19.8%). The data from the 1996 Agricultural Census show that 54.2% of farmers and 45.2% of rural inhabitants over the age of 15 undertake other income-generating activities simultaneously with farming. The average number of persons actively employed in agriculture per 100 hectares of agricultural land dropped in Poland from 24 persons in 1989 to 22.9 persons in 2000. This number, likewise, varies considerably across space, ranging from 7 persons in the Western Pomeranian voivodship and 9 persons in the Warmian-Masurian voivodship to about 50 persons in the Carpathian piedmont regions (Figure 2).

W. M. Orłowski (2001) estimates the number of farm workers in Poland as equal roughly 2.5 million, and the number of persons forming the so-called “social sector” (not working and running agricultural activity as a secondary one) as equal at least 1.5 million. According to this author the real share of population actively employed in Polish agriculture amounts to 16% and is comparable with the average for the OECD countries. A. Woś (2001) estimates the number of people constantly involved in agriculture at 1.6 million.

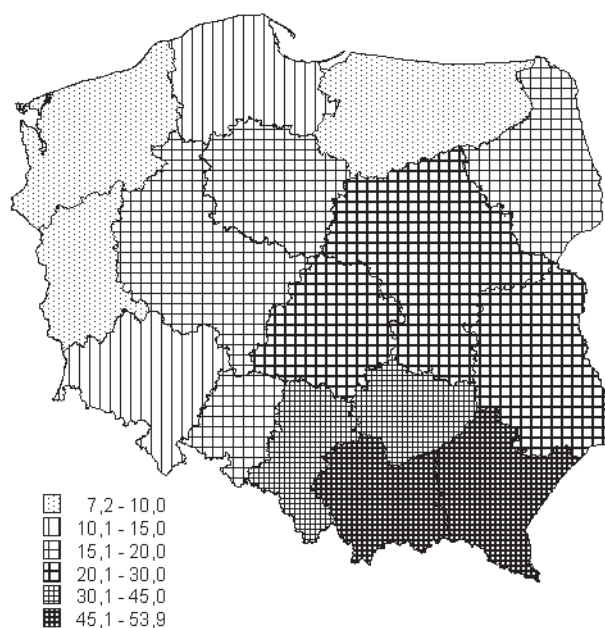


Figure 2. Number of persons actively employed in agriculture pre 100 hectares of agricultural land, 2000

According to W. Poczta and A. Mrówczyńska (2002) the number of fully employed in Polish agriculture amounts to 14.7 persons per 100 hectares of agricultural land, and varies across space from 4.7 persons in the Lubusz voivodship to 31 persons in the Little Polish voivodship.

The changes in labour resources in the 1990s encompassed their increase in the south-east and central Poland, where considerable surplus was noted, and a decrease in the northern and western parts of the country. In the EU the average number of persons employed in agriculture per 100 ha of agricultural land is much lower, and ranges in particular countries from 2.6 persons in United Kingdom through 3.5 in France and Spain, 9 in Italy, up to 16 in Portugal (Figure 3).

The rural and agricultural population is characterised by the lower level of education in comparison with the urban population. In 1998 44.6% of farmers had the primary and incomplete primary education. Only 17.5% of agricultural population living on rural territories have secondary education (in towns: 34.3%). In the majority of EU-15 the level of education of rural population is much higher (Figure 4).

Agrarian structure

At the beginning of the 1990s significant changes took place in Polish agrarian structure – especially in terms of land ownership. In 1989 private farming

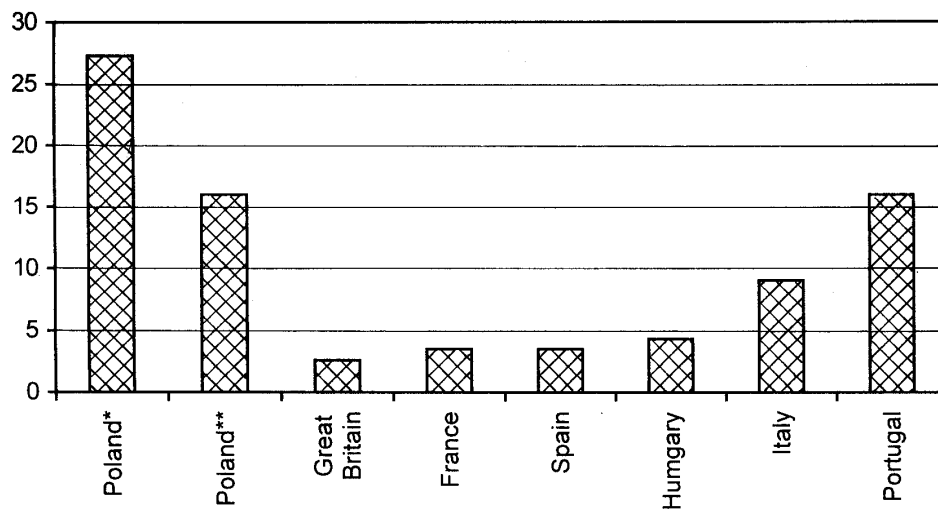


Figure 3. Percentage share of population actively employed in agriculture in total employment

* data according Main Statistical Office

** data according Orłowski, 2001

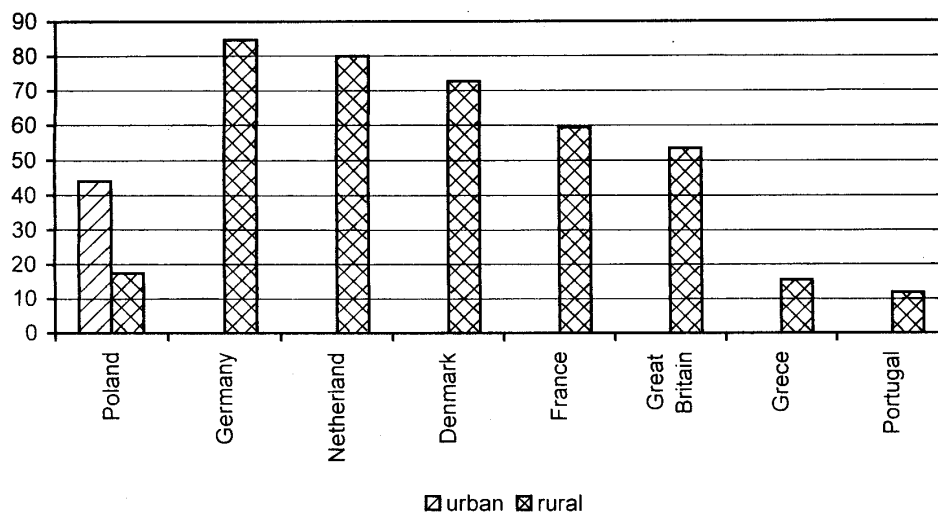


Figure 4. Percentage share of rural population with high and university education in total number of rural population, 2000

owned 76.2% of total agricultural land in Poland, state farms possessed 18.8%, 3.8% was under collective ownership, and some 0.3% was kept by the agricultural circles. In the years 1992–1995 state farms and agricultural circles were liquidated and their land, together with the land belonging to the State Land Fund was taken over by the Agency for Agricultural Property of the State Treasury. Under the administration of the Agency some 4 million hectares were

given to the users, out of which 2.9 million were leased and barely 380 thousand were sold. As the result of transformations the share of land used by private agriculture increased to 92% of total agricultural area and the average size of a private individual farm has increased from 7 ha in 1990 to 8 ha of agricultural land in 2001. Simultaneously, the number of individual holdings decreased from 2138 million to 1882 million in parallel with the process of polarisation involving the increase of the share of the smallest holdings (1–2 ha) and of farms above 15 ha. The smallest acreage of holdings is observed in the southern provinces of the country, while the provinces featuring the largest acreage were in the North, where farms of more than 15 ha constitute about 70% of total agricultural area. (Figure 5). In spite of these positive changes the average acreage of private farm in Poland was still more than two times smaller than in the countries of the European Union (Figure 6).

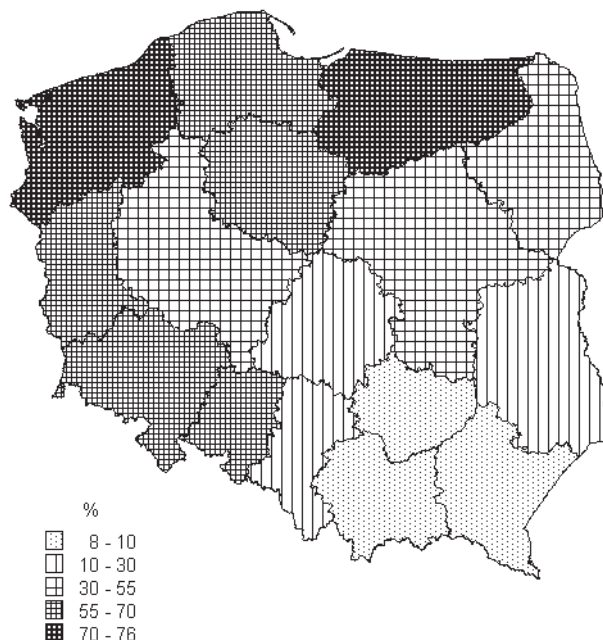


Figure 5. Agricultural farms above 15 ha as a percentage of total area of agricultural land, 1999

Investment expenditures and technical production means in agriculture

Financial expenditures in agriculture have significantly decreased in the years 1990–1999 (in constant prices), so that in the last year of this period they amounted to 42% of the level from 1990. There was also a wide range of values of this indicator across space: from 317 PLN/ha (Polish zlotys per hectare) in the

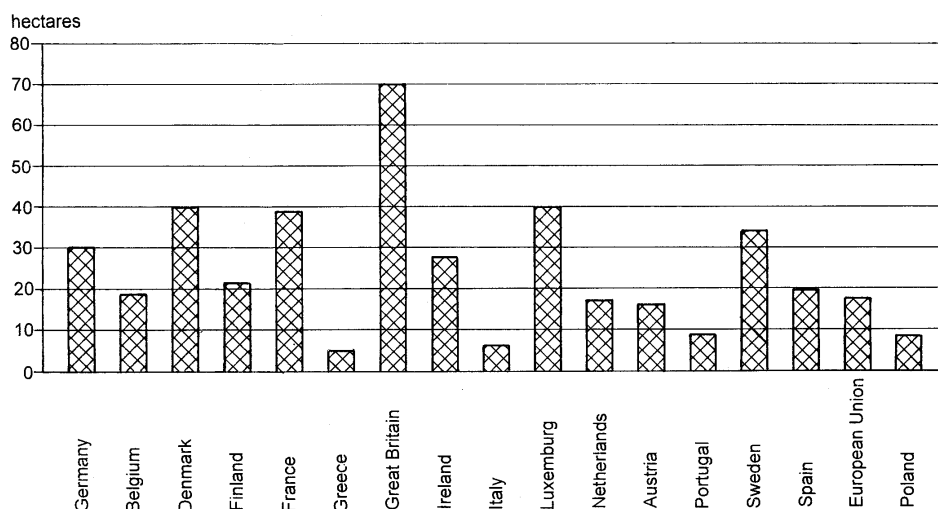


Figure 6. Average size of farms in Poland and in the UE countries, 2000

former province¹ of Poznań (Greater Poland) to 31 PLN/ha in the former provinces of Krosno (Carpathians) and Jelenia Góra (Sudety Mountains).

In the years 1989/1990–1992/1993 a distinct collapse of application of mineral fertilisers was observed – from 164 to 66 kg of NPK per hectare of agricultural land. The greatest decrease of volumes of mineral fertilisers applied was observed in that period in the northern and western parts of Poland in connection with the decline of plant production in the former state farms. By 2000/2001 application of mineral fertilisers increased up to 85 kg, though it is still much lower than in most of the EU countries (Great Britain – 121 kg, Denmark – 152 kg, France – 162 kg, Germany – 172 kg, Belgium – 200 kg, The Netherlands – 236 kg).

Sale of plant protection chemicals decreased from 20,600 tons (active content) in 1989 to 8,800 tons in 2000. During the last two years only some 0.62 kg of plant protection chemicals per 1 ha of arable land was used.

Total traction in agriculture in Poland grew from 9 million traction units in 1990 to 10 million in 1999, and the animal traction share, associated with the decrease in the horse number, shrank in the same period from 9.7% to 4.7%. The number of tractors increased during this time interval from 1.1 million to 1.3 million. The area of agricultural land per 1 tractor decreased from 16 ha in 1990 to 14 ha in 2000 (in the Netherlands – 5.2, in Italy – 5.6, in Germany – 9.7, in France – 14). In fact, over half of these tractors are old, produced before 1980. There is lack of small tractors adapted to the very numerous small farms.

¹ Between 1976 and 1998 Poland was divided into 49 provinces of the size of French departments, after which the larger units (16) were re-established.

Agricultural land use and crop production

Poland belongs to the countries with high percentage of agricultural land in the total area (54%) and a very high percentage of arable lands in the total of agricultural lands (77.2%). The data from the 2002 Agricultural Census show, however, that since 1996 the area of arable land decreased by 5.1% (0.7 millions of hectares), and the sown area shrank by 12.5% (1.5 million hectares). In the years 1990–2002 fallow lands increased from 163 thousand hectares (1.1% of total arable land) to 2.3 million of hectares in 2002 (13.6% of total agricultural area and 17.6% of total Polish arable land). The highest shares of fallow lands occur in the northern and western regions of Poland (20–25%), where this is associated with the extensification of agricultural production (the former provinces of Olsztyn, Słupsk, Koszalin and Zielona Góra), and in the former province of Warsaw, where the cause of fallowing is the wish of changing the function of the agricultural land into the non-agricultural one.

In 2002 the agricultural use of land for crop production was dominated by cereals (8.3 millions hectares and 77% of total area of crops, 65.6% in 1995), including wheat (22.4%, 18.7% in 1995), rye (14.5%, 19% in 1995), cereal mixtures (12.7%), and barley (9.8%, 8.1% in 1995). Among root crops potatoes dominate (7.5%, 11.8% in 1995); industrial crops took 7%, with 4.3% under rape seed. The changes in the crop structure during the 1990s consisted in the growth of share of the cereal area (by about 20% with respect to the year 1990 and by 11.5% in the years 1995–2002). There was a particularly steep increase in the shares of wheat and cereal mixtures, accompanied by a decrease of the area under rye and barley. Regarding other crops the areas under potatoes and crops for green forage decreased during the period in question.

Yields of cereals decreased from 3.2 tons per hectare in the years 1989–1991 to 2.7 tons in 1992–1995, then to 2.5 tons in 2000, and then increased to 3.2 tons in 2001–2002, still far below the levels of Germany – 6.2 tons, France – 7.2, Great Britain – 7.0.

Crop production in 2000 was lower by 17.5% in comparison with its value from 1990, the cereal production having dropped from 27 million tons in 1990–1991 to 20.8 million tons in 1992–1993 (decrease of yields and of the sowing area), then increased to 24 million tons in 1999–2000, and to almost 27 million tons in the years 2001–2002.

Production of potatoes decreased from 35.4 million tons in 1989–1990 to 22 million tons in 1999–2000 and 17.5 million tons in 2001–2002. Yields of potatoes in Poland depended very much on weather conditions and have been varying from 13.3 tons per ha in 1992 to 20 tons in 1998, 16.2 tons in 2001 and 19.3 in 2002. In selected EU countries these yields were as follows: in Belgium – 49 tons, in Netherlands – 43 tons, in Germany – 40.2 tons, in France – 37 tons.

The total harvests of vegetables (5.5–6.0 million tons) do not show bigger variations except for the lower harvests in 2002, while production of fruits from trees

rose from 1.8 million tons in 1990–1995 to 2.3 million tons in 1999–2000 and 2.8 million tons in 2001–2002. More than $\frac{1}{3}$ of tree fruits came from the small, but very intensive orchard region located South of Warsaw.

Animal breeding

In comparative terms the value of animal production in Poland decreased by 8.3% in the years 1990–2000. Two species of farm animals are of greatest importance in animal breeding in Poland – cattle and pigs. In the years 1990–2002 the number of cattle stock decreased from 10 million heads to 5.5 million heads, reaching the level close to the situation of 1947. The average number of cattle per 100 hectares of agricultural land decreased from 54 heads in 1990 to 35 heads in 2002. The highest number of cattle per 100 ha of agricultural land is noted in the Podlasie Province (53 heads), the lowest in the western provinces of the country (12–12.6 heads). The fact that the number of cattle dropped almost by half in the northern and western Poland was to a great extent caused by the liquidation of state farms.

The pig stock increased from 19 million heads in 1990 to 22 million in 1992, but then shrank to 18.6 million in 2002. The number of pigs per 100 ha of agricultural land decreased from 110 heads in 1992 to 97 heads in 1997 and increased in 2002 to 110 heads – yet not because of a pig stock increase, but because of significant decrease of the area of agricultural land. This number was much higher in most of the EU countries, e.g. in The Netherlands – 572 heads, in Denmark – 444, in Belgium – 496, or in Germany – 143, but it was lower in France – 51, Great Britain – 48 and Italy – 83.

Sheep breeding was virtually completely discontinued (decrease from 4.2 million heads in 1990 to 342 thousand in 2002). A certain recession was also noted in poultry production.

Land and labour productivity

The value of agricultural production per unit of agricultural land, treated as land productivity indicator, is an important index of socio-economic efficiency of land. Land productivity measured in PLN per 1 ha of agricultural land attained in 2000 the value of 3041 PLN (about 760 USD). Out of total gross agricultural production 59.4% constitutes commercial agricultural production (62.5% in 1990). According to *Polska Wieś* (2002, Table A36) the average value of commercial agricultural production per 1 hectare of agricultural land was equal 1805 PLN in the year 2000. For spatial differentiation of the level of agricultural production is shown in Figure 7 and 8.

There are historically conditioned regional differences in the levels of agricultural development and in the levels of land productivity in Poland. High levels of land productivity characterised Greater Poland, Kujawy, Western Pomerania and Lower Silesia, as well as agricultural suburban zones of big agglomerations

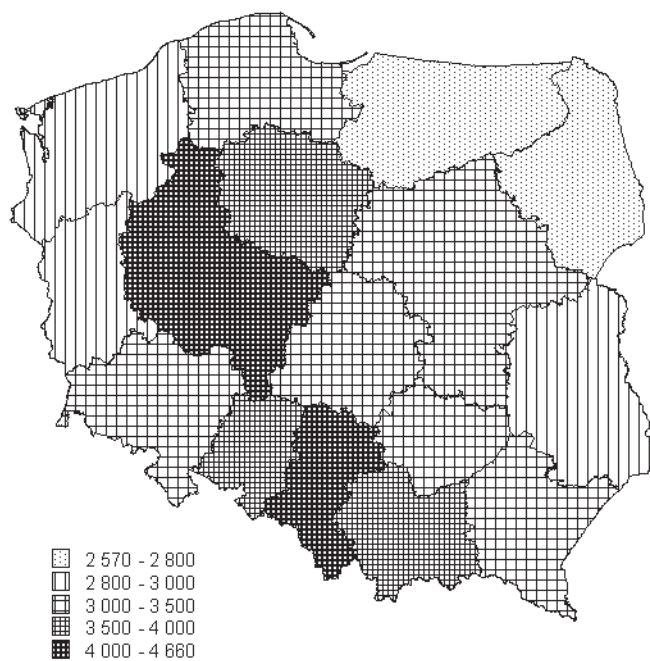


Figure 7. Value of gross agricultural production in PLN per hectare of agricultural land, 2000

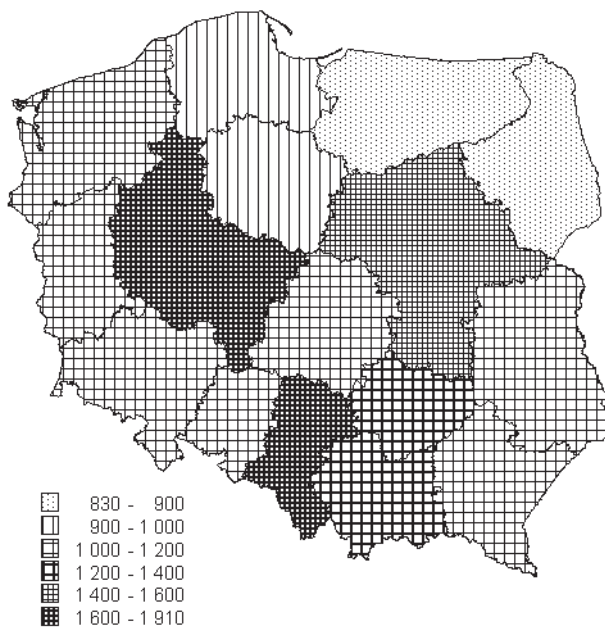


Figure 8. Agricultural added gross value in PLN per 1 ha of agricultural land, 1999

with high degree of specialisation in horticulture. The lowest level of the index mentioned was noted in central and eastern provinces, where small scale individual holdings dominate and more than half of them are subsistence farms (Figure 9 and Figure 10).

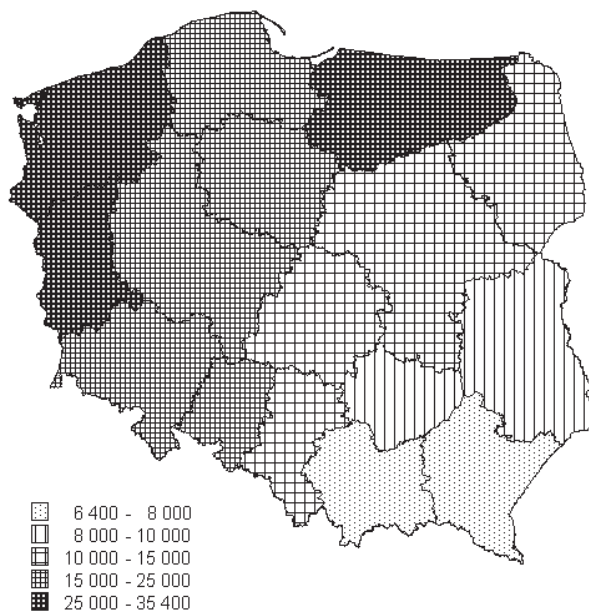


Figure 9. Value of gross agricultural production in PLN per 1 person fully employed in agriculture, 1999

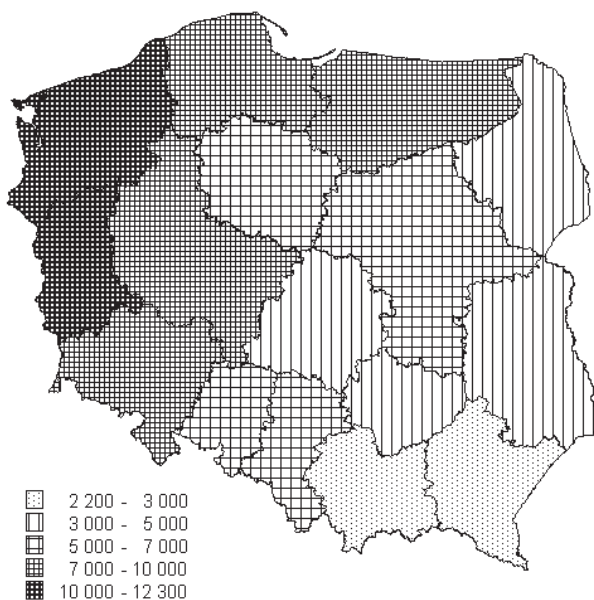


Figure 10. Agricultural added gross value in PLN per 1 person fully employed in agriculture, 1999

Another important measure of agricultural efficiency is the value of agricultural production per 1 person actively employed in agriculture. In the study here reported labour productivity is shown through the value of gross agricultural production in PLN per 1 person fully employed in agriculture. In 1999 the index mentioned attained 14,355 PLN, while the value of gross added agricultural production per one person fully employed in agriculture was equal 5113 PLN. Spatial differentiation of this first index is closely connected with the size of farms, level of education of farmers, level of mechanisation, as well as degree of specialisation of agricultural production. The spatial differentiation of labour productivity in Poland is shown in Figures 9 and 10.

Conclusions

Polish agriculture is diversified across space due to natural conditions and historical past. Stagnation or even regression of agricultural production, brought about by the technological backwardness of this sector of economy and the worsening profitability of production, caused that starting with 1993 foreign trade in agricultural and food products has been noting negative net balance in the exchange with the countries of the EU. Four times higher direct subsidies for the EU farmers and the financial support for the processed food products cause that agricultural production of these countries is and will remain more competitive than Polish agriculture. State allowances in the form of direct subsidies for agricultural producers and for maintenance of prices of agricultural products amounted to 765 EUR per 1 ha of agricultural land in the EU and to the mere 172 EUR per 1 ha in Poland. The same goes for the most recent proposals of the EU Commission concerning future direct subsidies for Polish farmers (after 2004), which will be four times lower than the respective support for the EU farmers (along with 10 year transitional period).

Further processes of transformation of Polish agriculture are, however, unavoidable, although they will be significantly distributed over time, and connected with Polish membership of EU. Inclusion into the EU agricultural policy and liberalisation of agricultural trade with this group of countries may be in the future a factor of development of agricultural production. Nevertheless, according to A. Woś (2001) besides certain benefits, which are promised by integration, at the same time the integration demands certain real concessions, such as additional costs of partial loss of national independence, broadening of the range of risks and social fear of unknown future.

The hope for the resolution of these problems resides not so much in agriculture itself as in the remaining links of the food economy, which, following the model of the western European countries, ought to form with time a food system chain united by the common interest, rather than the set of isolated links. The present Polish food economy is characterised by too high employment in agriculture and too high percentage of agricultural production in the total value of production of this sector.

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