

Codes of Good Agricultural Practices for Crop Production in Poland

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CODES OF GOOD AGRICULTURAL PRACTICES FOR CROP PRODUCTION IN POLAND

Managing land for the production of food, fiber, or timber necessarily has some environmental impact, the magnitude of which depends on the cropping system and the intensity of management. Good Agricultural Practices (GAP) use the means of production most efficiently to obtain optimum crop yields of good quality while minimizing environmental pollution. The whole area of Poland is situated in the catchments of the Vistula and Odra Rivers, which drain into the Baltic Sea. Poland includes more than half of the inhabitants of the Baltic Basin, and they use 40 percent of the basin's arable land. Large-scale agriculture in Poland consists of traditionally farmed landscapes with a native flora and fauna richer than on comparable agricultural land in Western Europe. However, natural farming conditions in Poland are more difficult than those of our Western neighbors. A primary goal of Polish agricultural policy is securing food self-sufficiency for the nation, and, while accomplishing this goal will require intensification of agricultural production in some areas, it must be accompanied by a concern for environmental protection. The economic and social background of Polish agriculture and some state regulations provide the basis for this discussion of good agricultural practice.

Economic and Social Background and Goals of Polish Agriculture

The main goals of agricultural policy in Poland are very similar to those set by the Common Agricultural Policy of the EU countries (Jordan 1992). These goals can be described as :

- securing food self-sufficiency for Poland at food prices acceptable to the community;
- maintaining the farmer's income at an appropriate level (so-called income parity); and
- employing a definite (rather high) number of people in rural husbandry.

Food Self-Sufficiency

Poland is not yet self-sufficient in the production of cereals and concentrates nor in the production of dairy products. There are, however, export surpluses of fruits and vegetables, and surpluses are easily attainable in the production of potatoes, sugar, and crude vegetable oil (Table 1).

Table 1. The balance of agricultural products in Poland, 1991-94

Product	Production in thousands of tons	Balance, ^a percent	Consumption kg/ capita/ year
Cereals and concentrates	23371	- 4	118.0
Sugar	1584	3	38.6
Potatoes	28051	1	144.0
Oil crops grain	787	0	10.7 ^b
Fruits	2401	25	40.2
Vegetables	5427	3	119.0
Beef and pork	3062	-1	
Poultry	344	- 14	68.5
Milk and dairy products	12690	- 3	264.0 ^c

^a (export - import)/production

^b expressed in crude oil

^c milk and butter expressed in milk equivalent

Food production meets WHO requirements but does not fully meet the demands of the population. In the future, an increase in food consumption and a shift in consumption toward meat, dairy products, fruits, and vegetables can be expected. In order to secure food self-sufficiency for a growing population and to meet the expectations of the people, agricultural production should be increased by 10 percent by the year 2000. In order to accomplish this task, higher crop yields must be obtained by intensification of crop production.

The Income of Farmers

The economic situation of the agriculture sector is worse in comparison to other branches of the national economy. The scissors index is to farmers' disadvantage and the income parity is only 60 to 80 points (Table 2).

Table 2. The economic situation of agriculture in 1991-94

Year	GNP in agriculture ^a	Scissors index	Income parity
1991	101	75	63
1992	88	115	78
1993	101	97	88
1994	93	106	82

^a in percent relative to the preceding year

Source: Woce.

There are three main sources of farmers' income: agricultural production, part- or full-time employment outside the farm, and social allowances (including pensions). The share of these sources in the total income depends primarily on the farm size (Table 3).

Table 3. The structure of farmers' income in 1993-94

Farm size, ha	Agricultural production	Income outside of	Social allowances
		Agriculture (percent)	
Up to 3	27	40	33
3 - 7	47	27	26
7 - 10	68	14	18
10 - 15	79	9	12
More than 15	90	3	7

Source: Goraj (unpublished).

The highest share of the total income for small farms of up to 7 hectare comes from sources outside agriculture. A very important income source for these farms is the state budget, because the budget covers the major share of social allowances, including farmers pensions. Small farms, up to 5 hectare, make up about 44percent of the agricultural area in Poland and are most commonly found in the upper and middle Vistula basin (Figure 1). The owners of these small farms cannot make their living solely from agriculture and seek outside jobs and state support. The concentration of land ownership in this part of Poland is proceeding very slowly due to the lack of available land and overpopulated villages. On the large (15 to50 hectare) and very large (more than 50 hectare) farms,

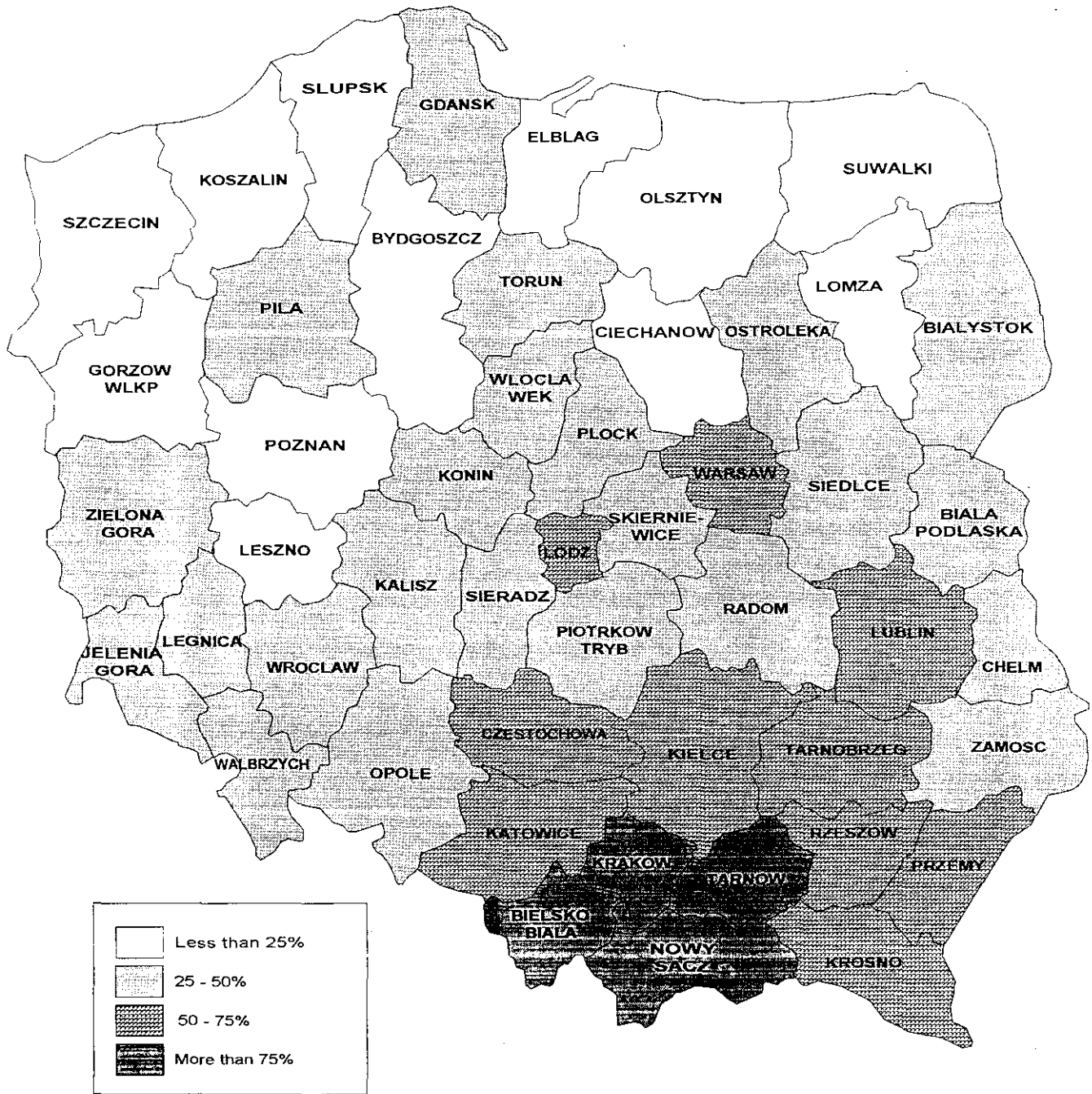


Figure 1. Percent of farms with less than 5 hectares
National average = 44%.

most of the income for farmers or tenants is from agricultural activity. Most of the very large farms belong to the State Agency for Land Ownership (SALO). The majority of these farms are now in a difficult economic situation due to heavy debts and overemployment. Fortunately, the process of restructuring the SALO farms through sales, leasing, or management contracts is proceeding fairly rapidly. It is reasonable to assume that, by 2000, these farms will be economically self-sufficient. The very large farms cover a substantial area in the basins of the Odra River and the rivers flowing directly into the Baltic Sea (Figure 2). The landowners and tenants must apply intensive agronomic practices in order to achieve a sustainable income level.

In addition to farm size, another significant factor in determining farm income is the agricultural environment quality. In the Polish system of land valuation, four characteristics are considered: soil quality, soil moisture conditions, topography, and agro-climate. The best conditions for agricultural production are in the southeastern and southwestern parts of Poland (Figure 3).

Employment in Agriculture

A disproportionately high (in relation to the share of agriculture in the GNP) number of people in Poland make their living from agriculture (Figure. 4). In middle and eastern Poland, excluding urban areas, 40 to 50 percent of the working population is employed in agriculture. This is closely related to the large number of farms (more than 2 million) employing 1 to 2 persons each (Table 4).

Table 4. Farm employment

Farm size, ha	Number of full-time workers	
	per farm	per 100 hectares
Less than 2	1.1	69
2 – 5	1.5	39
5 – 7	1.6	27
7 – 10	1.8	21
10 – 15	1.8	16
More than 15	2.0	11

Source: Szemberg 1993.

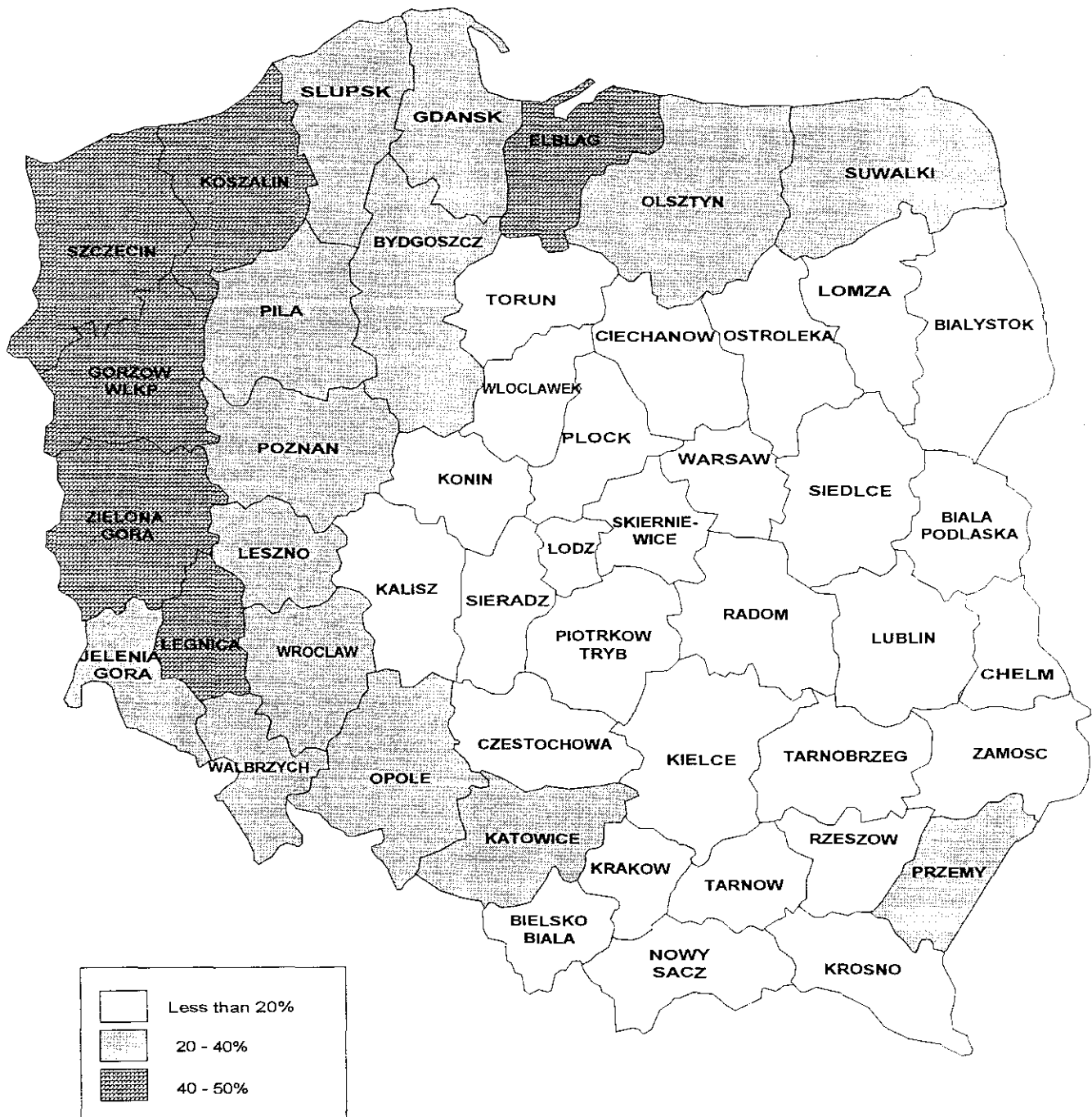


Figure 2. Percent of farms with more than 50 hectares
National average = 20%.

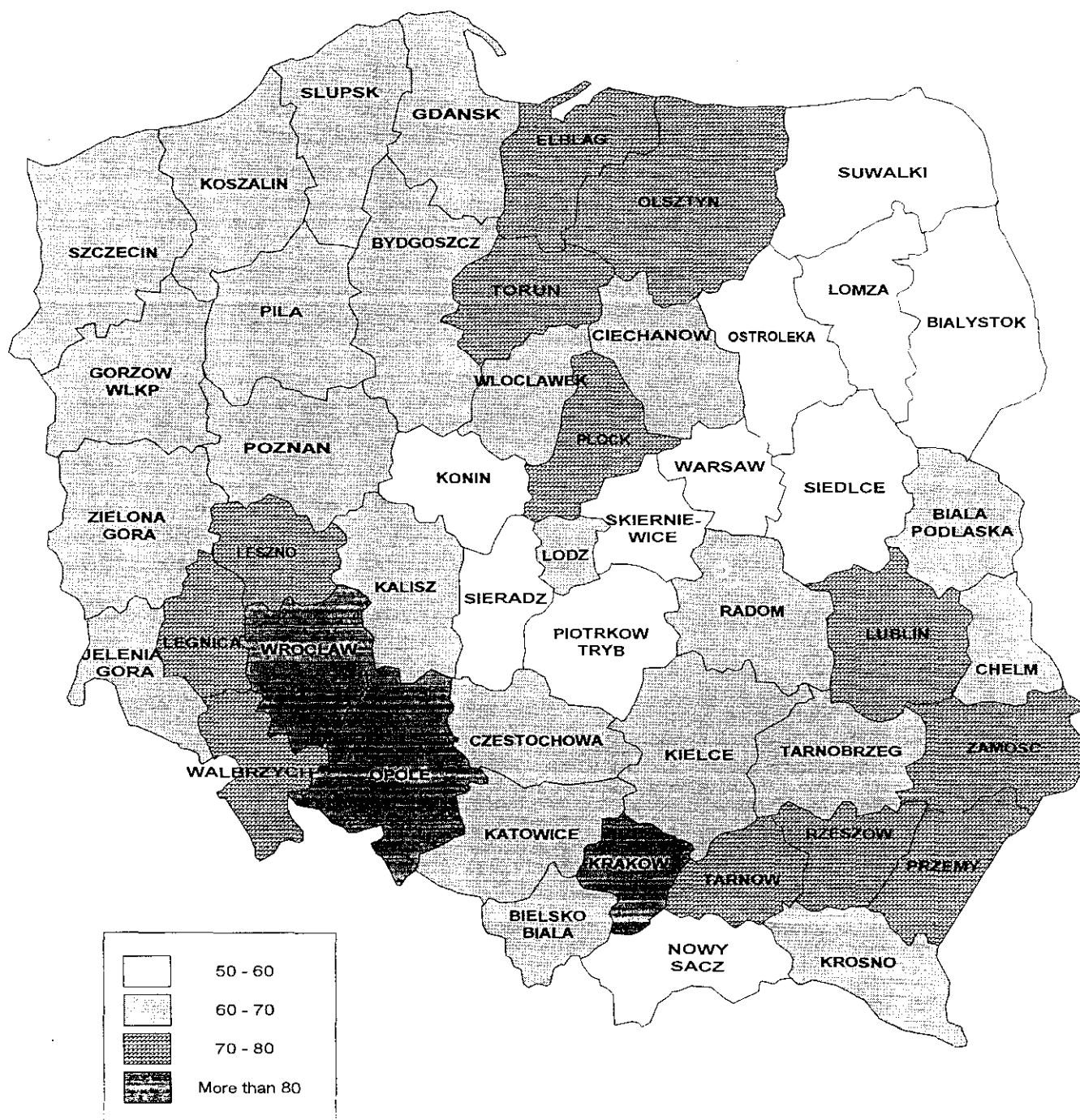


Figure 3. Quality of agricultural production area
National average = 65.

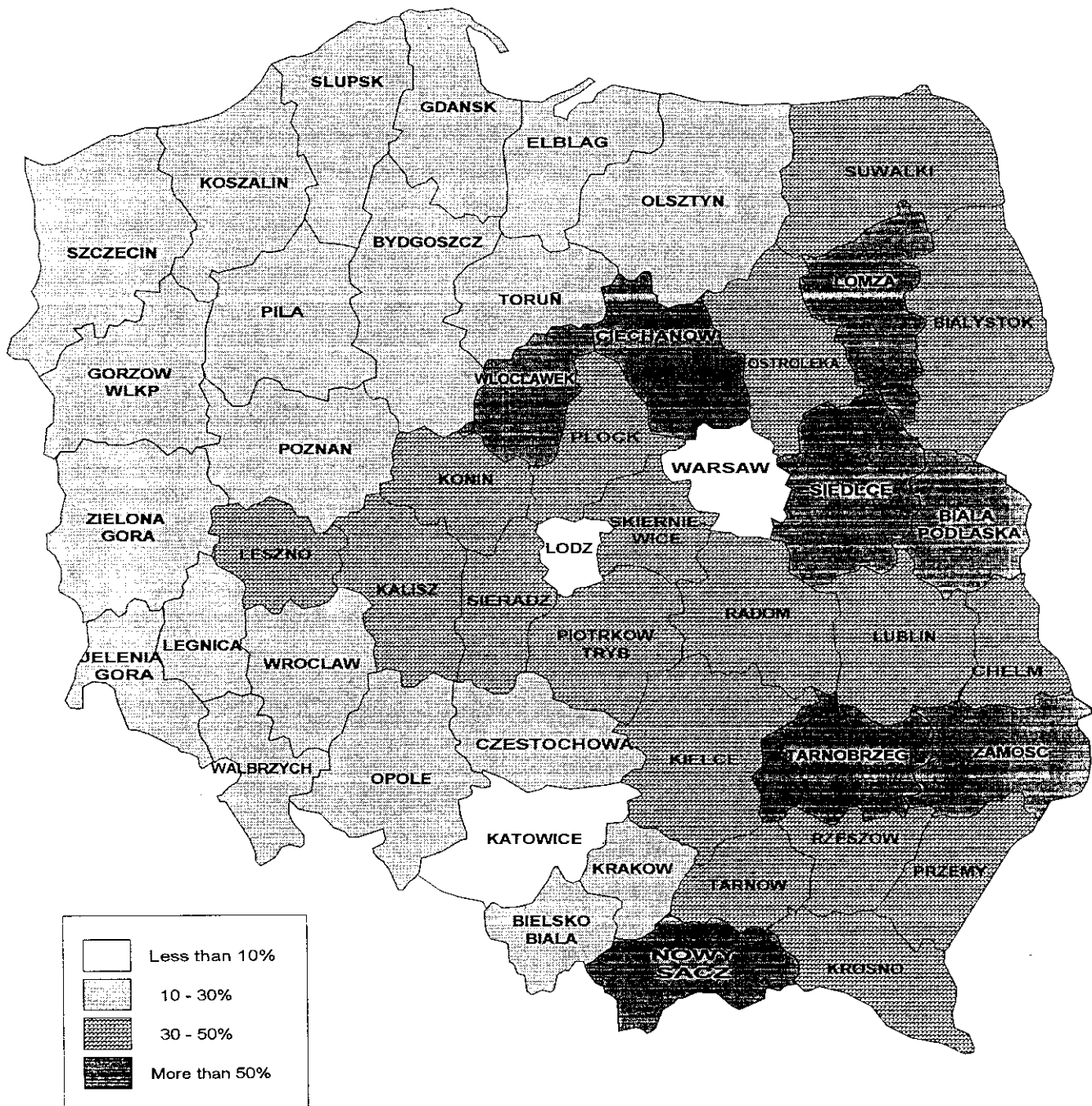


Figure 4. Percent of workers employed full time in agriculture, 1993

National average = 26.4%.

It is impossible for small farmers to sustain themselves solely by agricultural activity; therefore, most of their income comes from other sources (see Table 3). We can hardly expect that the problem of overpopulation in Polish agriculture can be solved soon. According to demographic predictions, in 2010 the proportion of the Polish rural population will still be as high as 18 percent.

Agriculture's contribution to the GNP is only 6.6 percent, and without the redistribution of national income on behalf of this sector the income parity of farmers will be very low. Another problem in agriculture is both the visible and hidden unemployment presently estimated at about 0.9 million workers, or more than 20 percent of the rural population. This figure is higher than the average for the entire country (15 percent).

The main instrument of the Common Agricultural Policy (CAP) in Western Europe is the system of subsidies to agricultural production. This system has been very efficient in accomplishing all the goals of the CAP, as described at the beginning of this paper. However, some negative consequences of the CAP are now challenging the European Union:

- overproduction of basic agricultural products;
- depopulation of the villages as a result of the land concentration and high level of mechanization of crop and animal production; and
- threats to the environment, particularly landscape impoverishment and high loadings of biogenic substances.

The system of subsidies for agriculture in Poland is very limited and it is highly improbable that it could be overefficient in realizing Poland's policy. In 1991–94, the agricultural sector received only 8 to 10 percent of the total state budget expenditure, including 6 to 7 percent of extra charges to the Agricultural Fund of Social Security. So-called *active subsidies* made up only 2 to 3 percent of the state budget (Figure 5).

Good Agricultural Practices on the Country Level

In the EU countries, codes of good agricultural practices (GAP) are being implemented to buffer the negative consequences of agricultural policy. The main idea of GAP is to combine the three goals of agricultural policy with a fourth, agricultural sustainability. This idea can be addressed on two levels: the level of the country or whole regions and the level of the single farm.

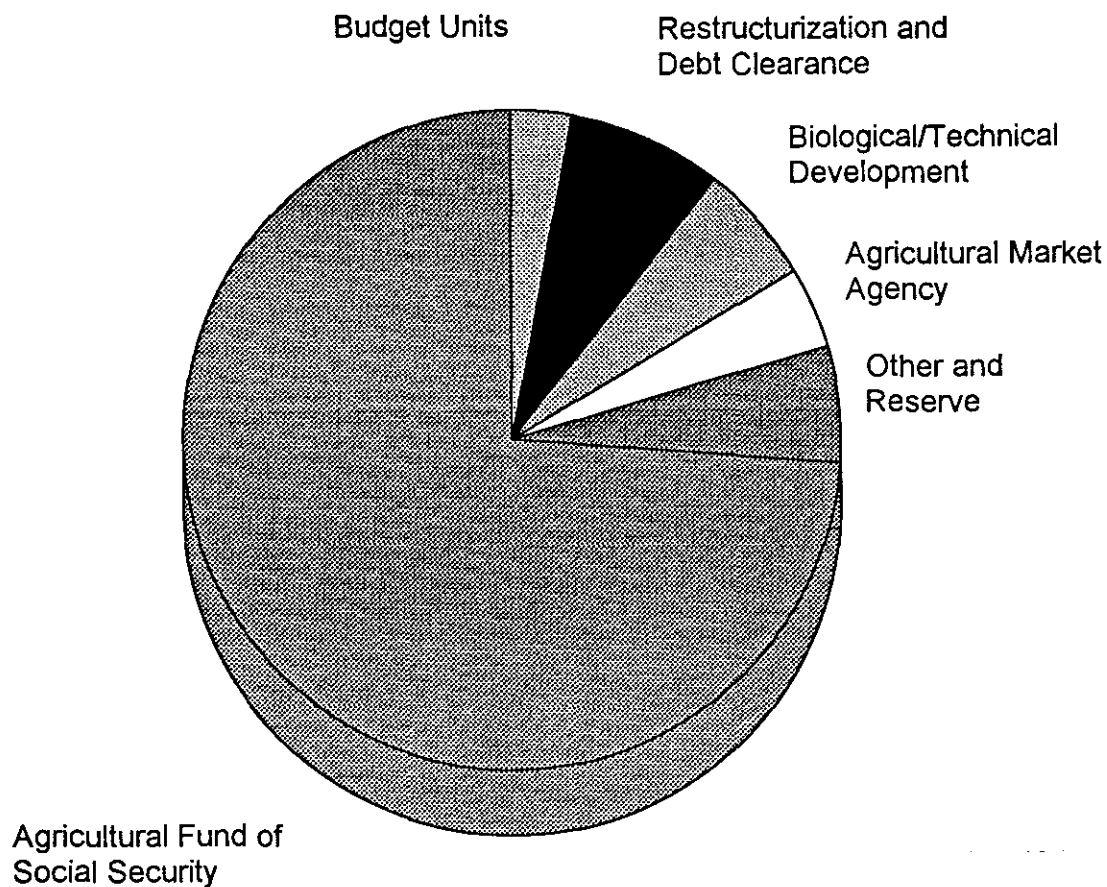


Figure 5. Distribution of budget subsidies for the agricultural sector in 1994

Source: Wos 1995.

Country-level GAPs are focused on these general problems:

- landscape diversity according to natural ecological conditions in several regions of Poland;
- diversification of cropping patterns fitted to the natural conditions and socioeconomic terms;
- sustained balance of mineral nutrients and soil organic matter;
- environmentally benign and controlled system of plant protection;
- soil protection against natural (erosion) and anthropogenic threats; and
- regulation of the area and management of set-aside land.

The implementation of GAPs on the country level is being accomplished through development of long-term state policy and a concise system of laws and regulations.

The Agricultural Landscape in Poland

The whole area of Poland is situated in the catchments of the Vistula River, Odra River, and the rivers draining directly to the Baltic Sea (Figure 6). With the exception of a small area in southern Poland, the entire country lies in the Baltic Sea basin. Land use is presented in Figure 7. Arable soils and orchards cover 46.6 percent, meadows and pastures 13.0 percent, forests 28.1 percent, and nonagricultural land 12.3 percent of the area. The land use differs substantially in different regions. The highest proportion of forests occurs in southern, western, and northern Poland (Figure 8). The regions in the catchments of the Middle Vistula and Odra Rivers are less wooded than the rest of the country. The largest area of meadows and pastures is in the upper and lower catchments of the Vistula River and in eastern Pomerania (Figure 9). The mountain and foothill regions are also characterized by a high proportion of permanent grassland. Arable soils prevail in the Middle Vistula catchment and the catchments of the streams that feed into the Odra River (Figure 10). The areas along the Odra River, in the mountains, and in the catchments of the rivers draining directly to the Baltic Sea have the least cultivated land. The diversity of the landscape outside of the forested areas depends very much on the size and distribution of the fields. The size of individual fields increases with the increasing area of the farm. As a consequence of all these factors, the agricultural landscape in the agriculturally intensive rural regions (Great Poland) is monotonous with large, uniformly managed fields prevailing. In middle and eastern Poland, the landscape is much more diverse, characterized by forest, meadows, and small cultivated fields under different crops. With respect to good agricultural practices, a diversified landscape is much more desirable, but unfortunately, the small farms contributing to this landscape cannot support their owners.

The agricultural landscape in Poland is protected by law. The main regulations are included in Bill Number 78, from February 1995, on the protection of agricultural land and woodland. This bill covers the problems concerning land protection and land reclamation and improvement. Despite these regulations, about 25,000 hectares of arable land are removed from agricultural utilization



Figure 6. The catchment area of the main river

Source: Budzinska 1995.

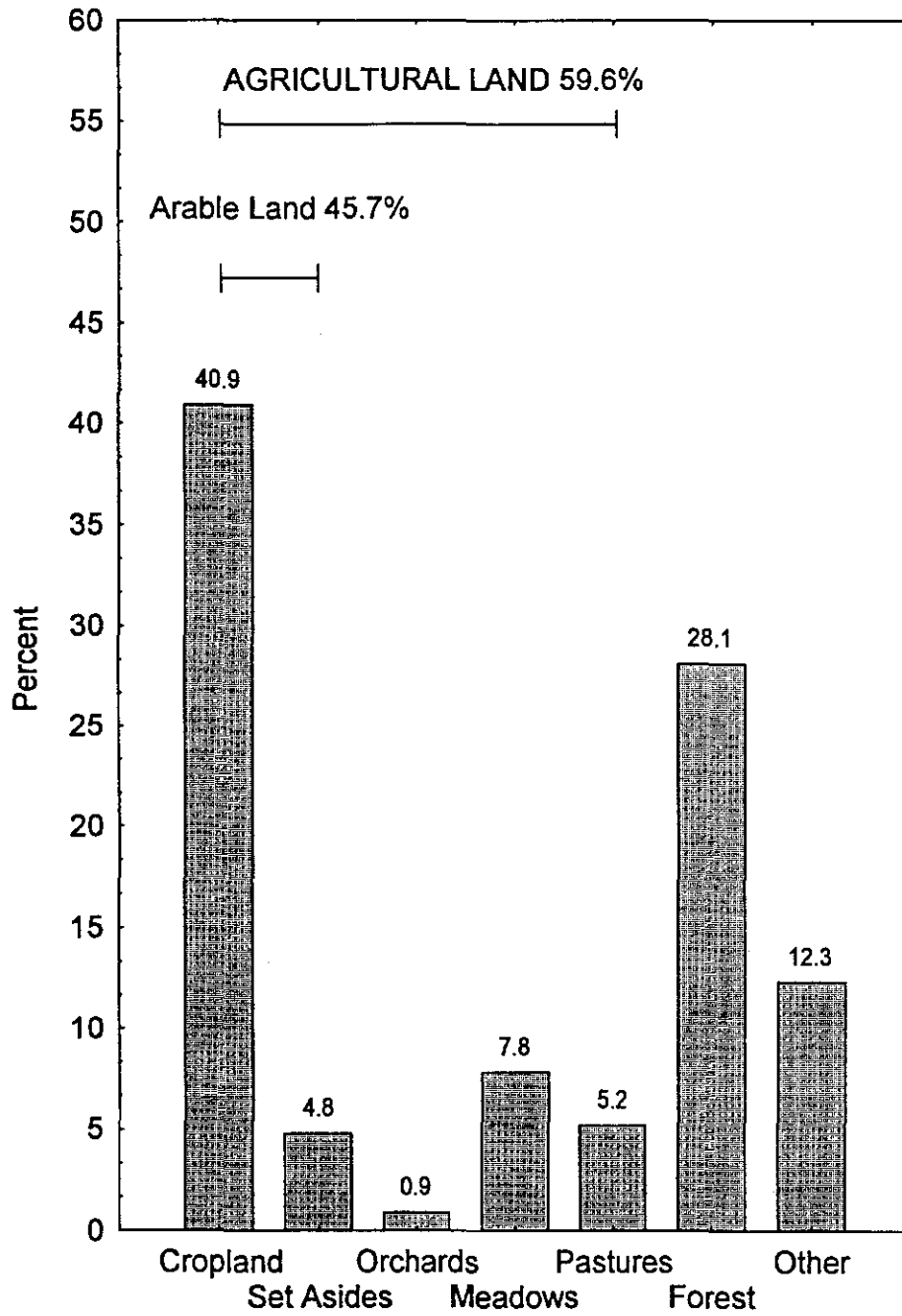


Figure 7. Land utilization in 1994

Note: total land area is 31,268 x 10³ hectares.

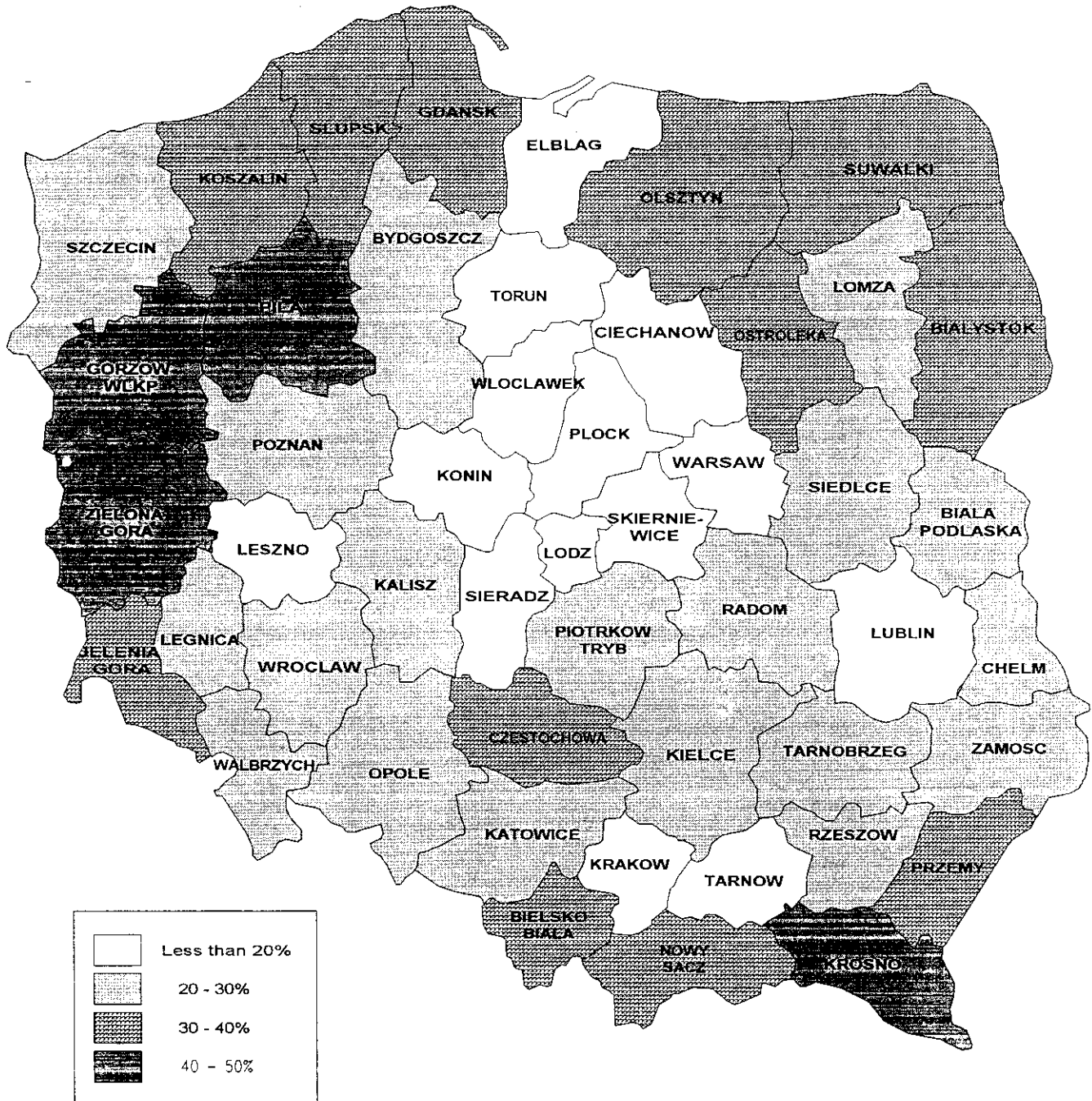


Figure 8. Forest area as a percent of total land area
National average = 27.3%.

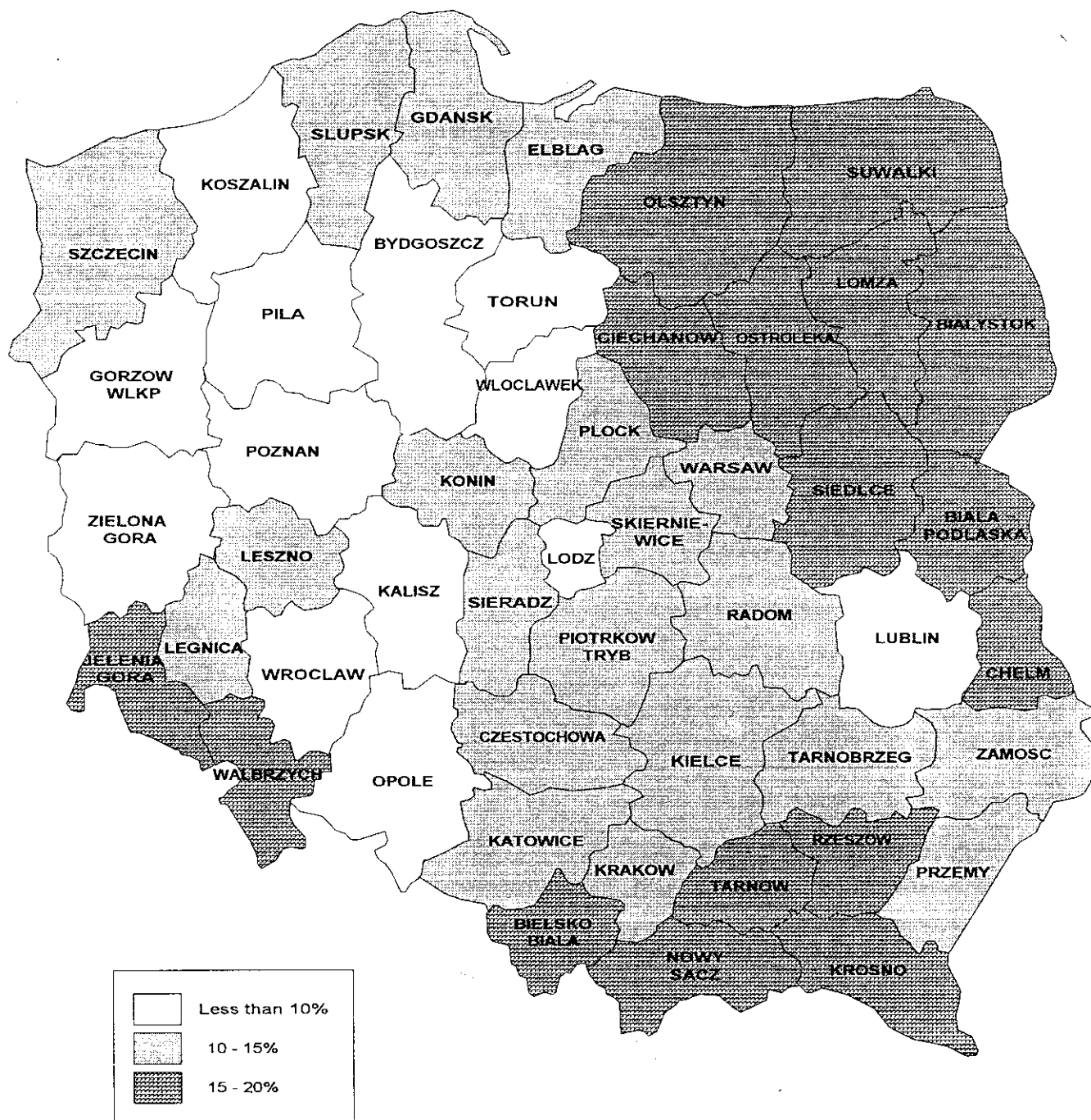


Figure 9. Grassland area as a percent of total land area
 National average = 12.9%.



Figure 10. Arable land area as a percent of the total land area
 National average = 47.2%.

every year. Approximately half of this area is reforested and half is assigned for the construction of settlements and roads. In the future, this process will be accelerated due to the construction of highways and the expected development of urban areas.

Cropping Pattern

The pattern of crop production in Poland is diversified (Figure 11). In the cereals group, wheat and rye are the primary crops, but barley and mixed grains are grown on large areas, while triticale and oats each are grown on about 5 percent of the arable land. In the fodder crops group, legume plants and grasses make up the largest share. Annual crops, such as maize, fodder beets, and several mixtures are also produced. In the group of “other” crops, vegetables and strawberries predominate. On small areas in some regions, hops or tobacco are grown. The cropping pattern depends on farm size (Figure 12). As farm size increases, the proportion of cereals (particularly wheat) and rape increases while the proportion of potato and fodder crops decreases. The number of species in each crop group also decreases with increasing farm size. This is another factor contributing to agricultural landscape monotony in the regions where big farms prevail.

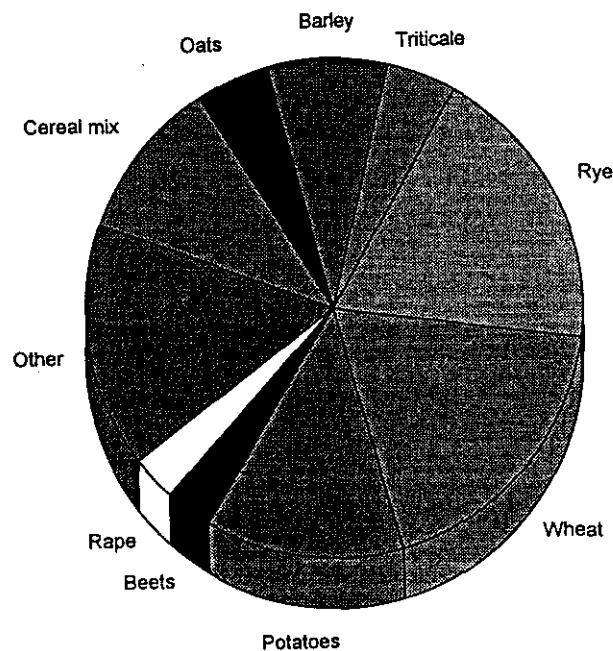


Figure 11. Cropping patterns in Poland, 1994

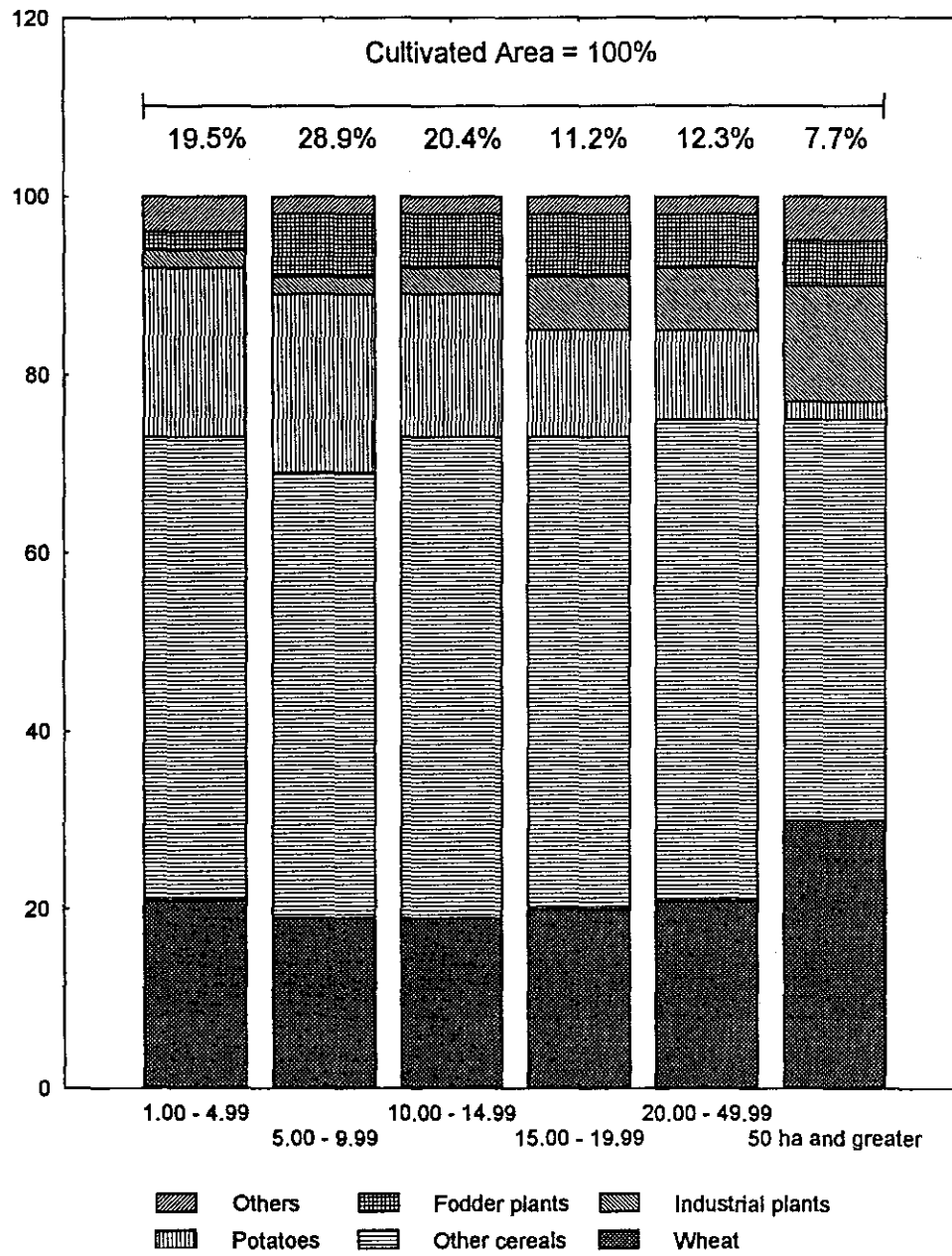


Figure 12. Cropping patterns on private farms in 1994

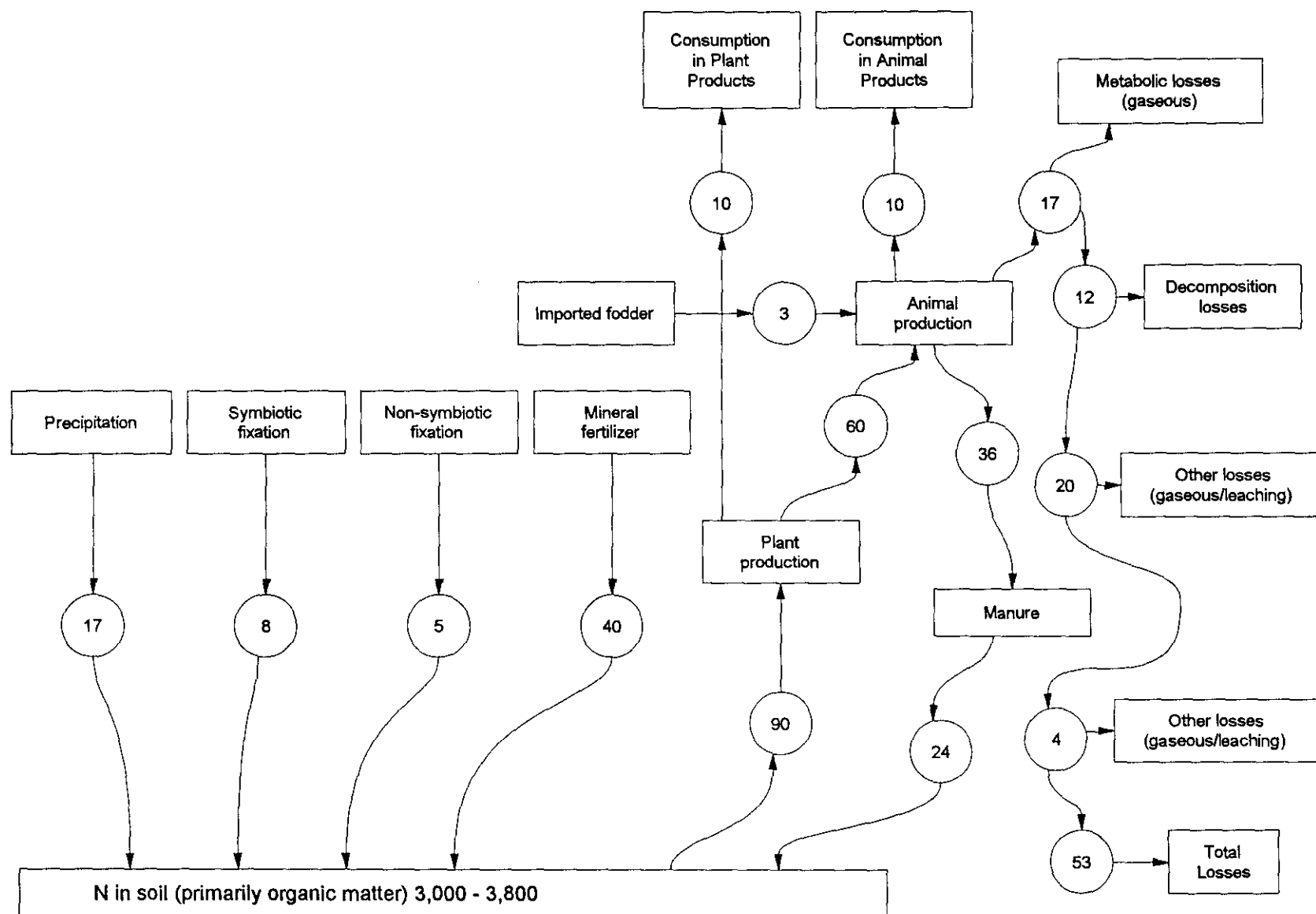


Figure 13. Nitrogen balance in Polish agriculture in 1991

Source: Fotyma 1994.

Balance of Nutrients and Soil Organic Matter

In the balance of nutrients, the main inputs are mineral and organic fertilizers and the main output is the uptake of nutrients by crops. Less important, and difficult to estimate, are the quantities of nutrients gained through atmospheric deposition and imported in feeds. With respect to good agricultural practices, the most important factor is the balance of nitrogen as a biogenic element (Figure 13). At the field level, nitrogen inputs and outputs are currently balanced. The total input from fertilizers, atmospheric deposits, and biological fixation is estimated at 94 kg nitrogen per hectare, while the nitrogen uptake by crops is about 90 kg nitrogen per hectare. These figures do not account for the large losses of nitrogen from agriculture, which are estimated to be 53 kg nitrogen per hectare. However, these losses occur in the transformation of crops into fodder and in animal metabolism, including excrement. These losses have nothing to do with crop production and are point sources rather than dispersed pollution. The nutrient balance at the field level varies among the regions of the country (Figure 14). This can be explained both by differences in fertilizer consumption and differences in agricultural productivity. Generally speaking, the balance of nitrogen is negative in the territory of the Vistula catchment and positive in the territory drained by the Odra River and the rivers draining directly into the Baltic Sea.

Fertilization practices are under the control of Agrochemical Laboratories (17 laboratories in Poland), whose main responsibility is to conduct soil analyses and develop fertilization recommendations. The draft of a bill on fertilizers and fertilization is being prepared. This bill will include regulations concerning fertilizer registration, handling, and safe application as well as regulations concerning the activities of Agrochemical Laboratories.

Plant Protection

The consumption of pesticides in Poland is low in comparison to that of the developed countries (Table 5). Even in the peak consumption period of the middle 1980s the consumption of pesticides was less than 1 kg of active substance (AS) per hectare of arable land. Over the past several years the consumption has more or less stabilized at about 0.5 kg AS per hectare.

Table 5. The consumption of pesticides in Poland

Year	AS kg/ha	Percentage of different pesticides groups				
		insecticides	fungicides	herbicides	rodenticides	others
1985	0.84	31	12	52	0.7	4.3
1990	0.51	8	20	65	1.0	6.0
1991	0.35	7	16	64	1.4	11.6
1992	0.46	5	16	69	1.0	9.0
1993	0.46	9	14	67	0.9	10.1

The low consumption of pesticides does not pose any serious threats to the environment, although in some individual cases there are abuses that lead to environmental damage. One problem is that there are too many registered pesticides in Poland. As of 1995, more than 500 pesticides were registered, containing to a great extent the same or similar active substances, a situation that makes recommendations and control difficult. Plant protection is under the control of Laboratories for Crop Protection, which are active in all voivodships. The Laboratories issue forecasts concerning the appearances of pests and diseases and supervise (at least theoretically) the ways and means for their control. In July 1995, the Bill on Crop Protection was issued, and most regulations are in line with the regulations in EU countries. Poland has also ratified the International Codes for distribution and application of pesticides issued by the Food and Agricultural Organization of the United Nations in 1986.

Soil Protection

A large area of agricultural land in Poland has been degraded by three primary processes:

- water (including gully) and wind erosion;
- acidification due to natural and anthropogenic processes; and
- soil pollution by harmful substances emitted by industry and cars.

Water and wind erosion damage 28 percent of Poland's soils (Figure 15). The most severe gully erosion is found in several areas, making up 18 percent of the total agricultural area. The territory in

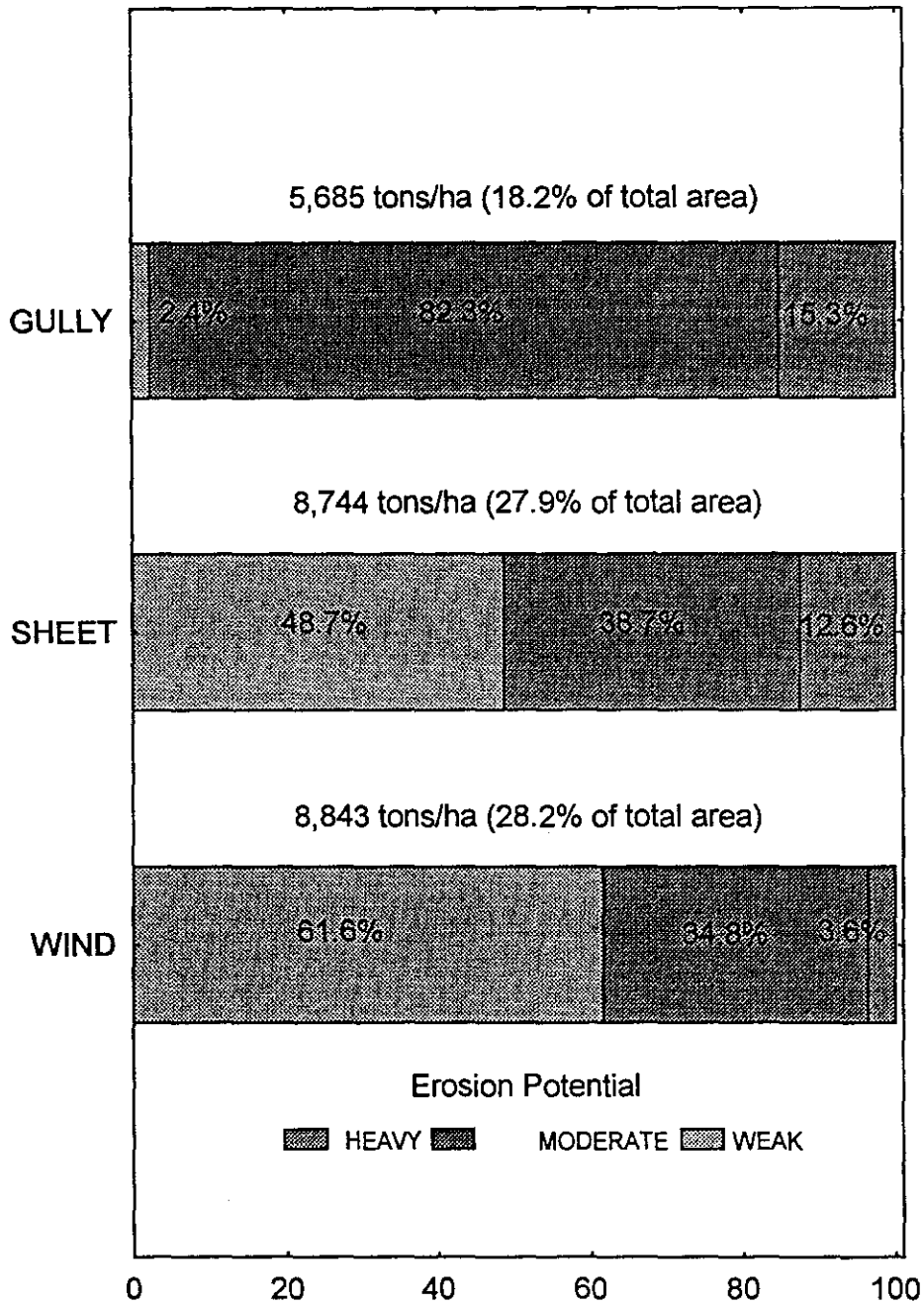


Figure 15. Erosion potential for agricultural lands and forests



Figure 16. Gully erosion in Poland

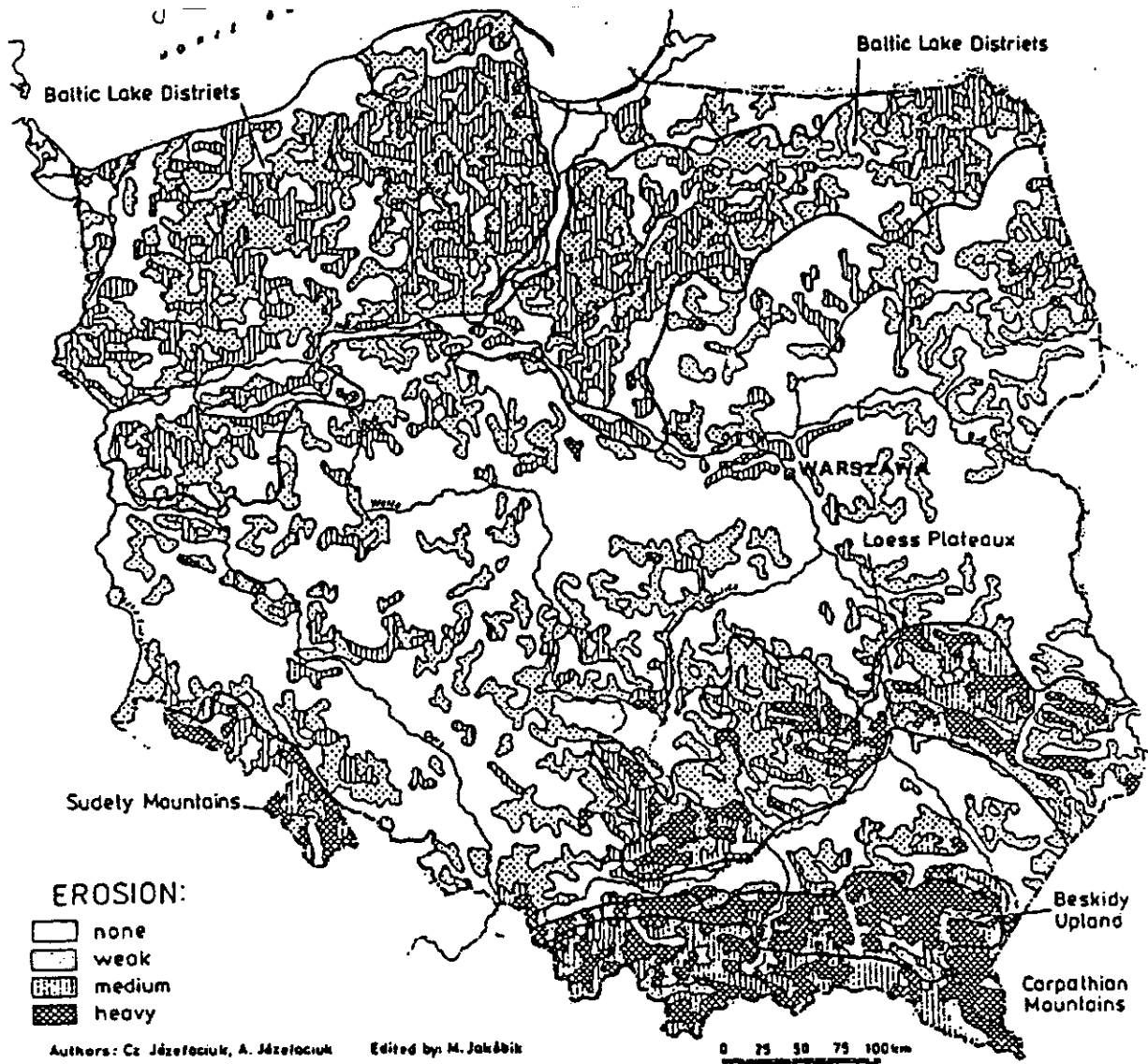


Figure 17. Potential water erosion in Poland

of middle Poland is mostly undamaged by erosion processes. The regulations concerning erosion prevention and reclamation of eroded soils are included in the bill on the protection of agricultural lands and woodlands.

Most Polish soils are damaged by natural and anthropogenic acidification processes. Very acid soils (pH below 4.5) cover almost 25 percent of the agricultural area (Figure 18). These soils are undergoing the degradation processes resulting in very low base saturation, disintegration of clay minerals, and unavailability of nutrients for the plants. The only effective measure for reclamation of very acid soils is heavy application of lime. The production and transport of calcium and calcium-magnesium soil amendments is subsidized by the state. The share of these subsidies in the total budget for agriculture is about 1.5 percent (Figure 5). Soil liming is one of the few elements of the technical process in agriculture that is subsidized by the state.

The majority of soils in Poland are "clean," not polluted by harmful substances. Most soils show a so-called natural content of heavy metals in accordance with the geological background. Only in southwestern areas, where there is a concentration of mining and metallurgy, are some soils polluted with lead, zinc, copper, nickel, and cadmium (Figure 19). The soils in Poland are regularly monitored for heavy metal content, sulfur, and some organic substances, and are tightly controlled. For areas where there is heavy soil contamination, there are special regulations requiring specific management practices and, in some cases, removing land from production.

Abandoned Land

In the last few years a new problem has emerged in Poland, that of abandoned land. This involves both fallow and set-aside land left unused by farmers, primarily due to economic reasons. The proportion of abandoned land in 1993-94 was estimated at 1.5 million hectares, almost 5 percent of the total area (currently, according to the Ministry of Agriculture, the proportion is 0.5 million hectares). This problem appeared to varying degrees in several regions of the country (Figure 21). More abandoned land is found in the Odra catchment and in the catchments of the rivers draining directly to the Baltic Sea. This correlates with the high concentration of very large farms belonging to the State Agency for Land Ownership, which have not yet been restructured. Land abandoned and, as a result, unmanaged, is against good agricultural practices. Although fertilizers and pesticides are not applied on these lands, they pose a threat by serving as a source of weeds and other pests. Responsibility for the abandoned land, according to the Bill on Land Protection, lies

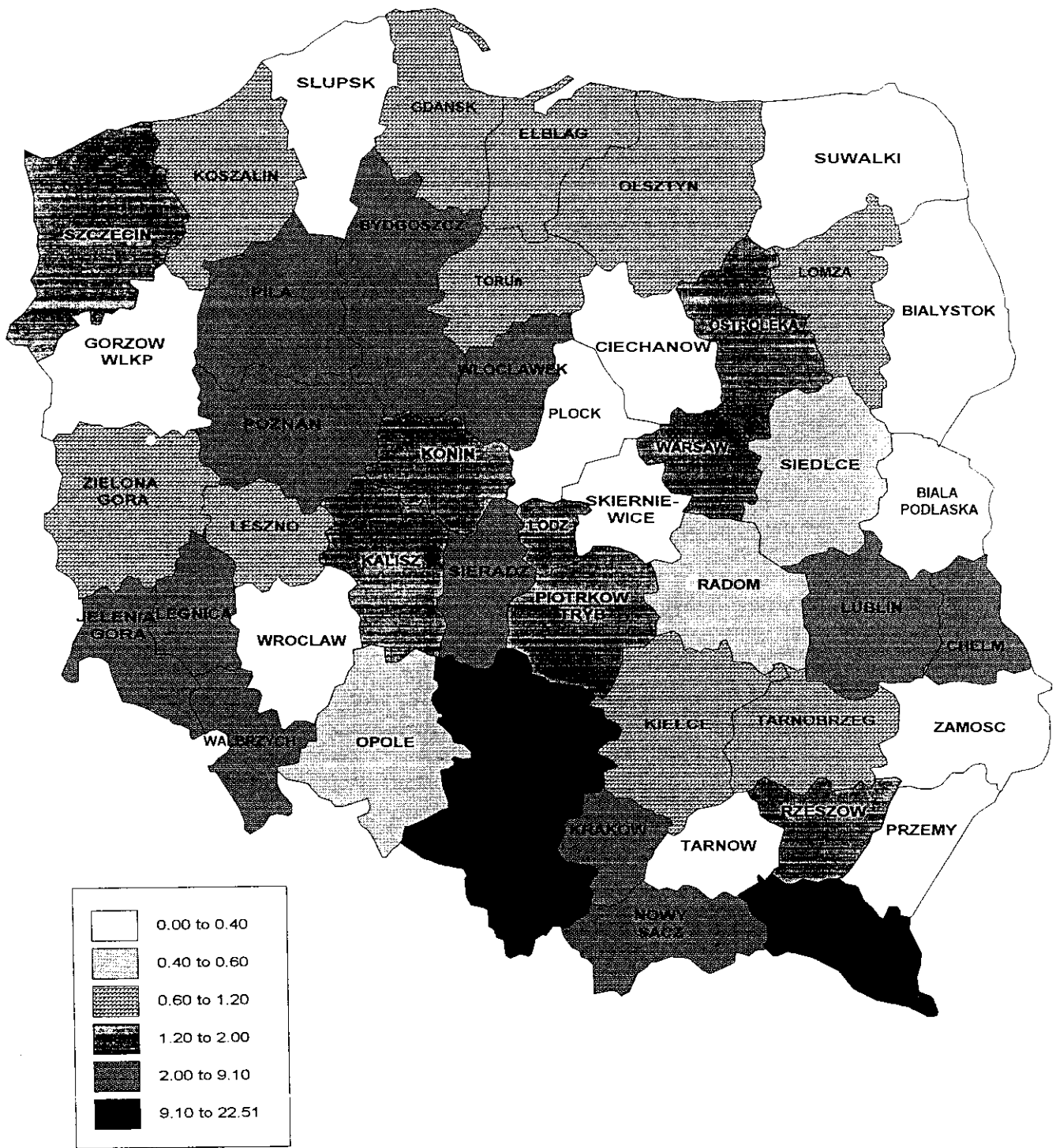


Figure 19. Percent of soils polluted with heavy metals (Cd, Pb, Zn, Cu, Ni)
National average = 2.3%.

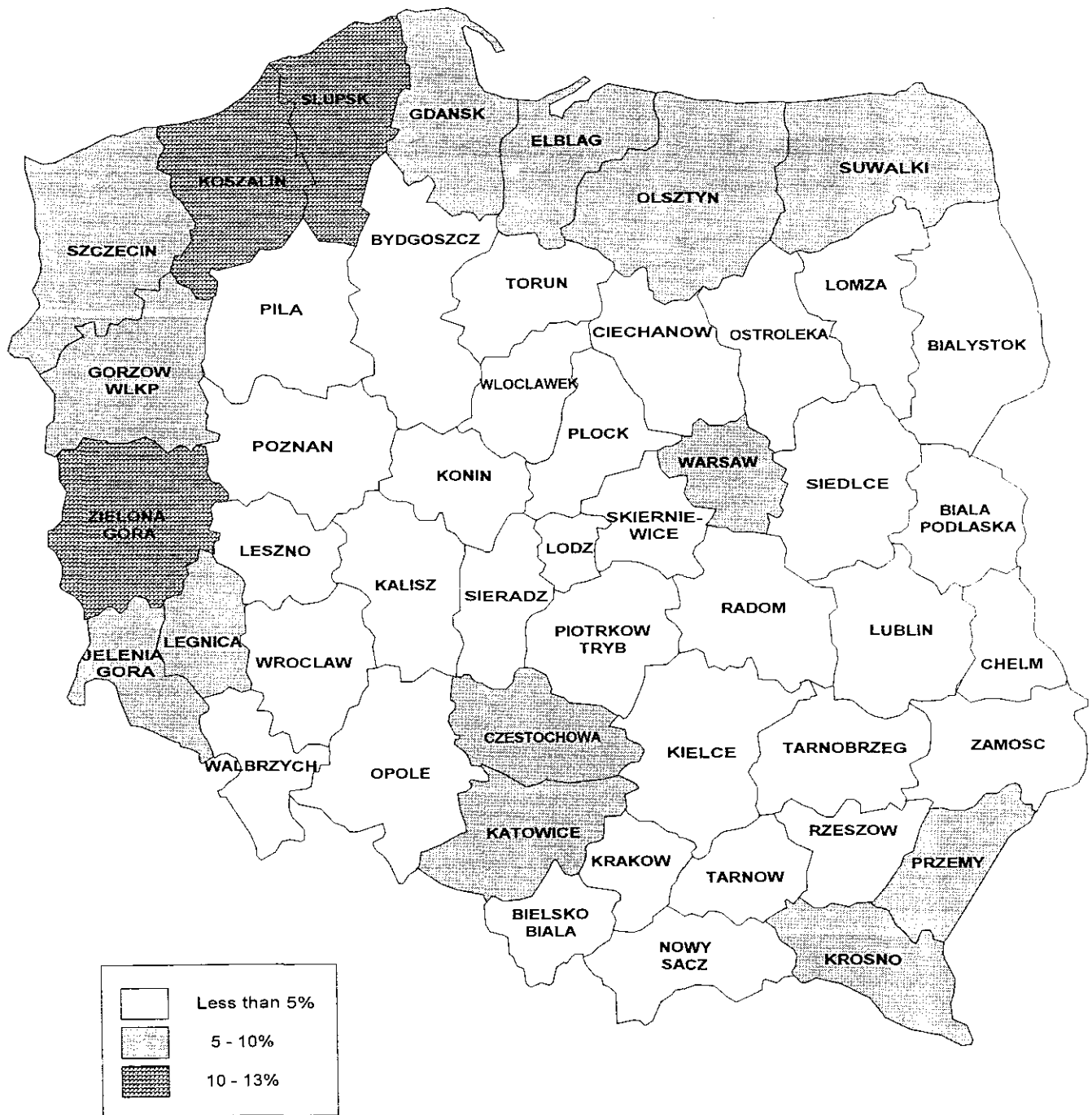


Figure 20. Set-aside land as a percent of total arable land in 1994
 National average = 4.9%.

with its owner. This responsibility is rarely undertaken properly because of the financial problems of many farms belonging to SALO. We can hope that, with the slowly improving financial situation of the large farms, the problem of abandoned land will decline, but, at present, the situation requires monitoring and some control by the state. Generally speaking, the fallow land should be managed and the lands unsuitable for agricultural production should be reforested. Reforesting 5 to 8 percent of the weakest soils in Poland will improve the woodiness of the country without posing any threats to food self-sufficiency.

Good Agricultural Practices on the Farm Level

GAP on the farm level is a continuous process of introducing biological and technical progress in order to make the farm economically viable and environmentally sustainable. The elements of GAP are:

- full sanitation of the farm including the housing estate, yard, and barns with the emphasis on sewage and organic manure utilization;
- properly situating the farm within the landscape;
- varied cropping structure and scientifically based crop rotations, eliminating unnecessary inputs of technical means, fertilizers, and pesticides;
- adjustment of the number and species of animals and stock feeding practices and maintaining self-sufficiency in fodder supply and on-farm manure disposal;
- a balanced system of mineral and organic fertilization oriented towards maximizing nutrient use and minimizing the quantity of mineral nitrogen remaining in the soil after harvest;
- a flexible system of soil tillage adjusted to the soil properties, crop successions, and the demand of the particular crop, with special attention to erosion risk;
- an integrated system of plant protection, including genetic properties of the variety, agro-technical measures and pesticides applied with consideration of the threshold application values for specific weeds and pests;
- keeping the fields in the proper technical and aesthetic conditions (ditches, field roads, field boundaries, etc.); and
- full management control of areas temporarily (fallow, set-aside lands) removed from agricultural production.

Each of these elements should be assessed quantitatively as indices measuring “optimal” values. Following the Girardin (1994) idea, the extent of fulfilling good agricultural practices on the farm level will be expressed in the form of GAP vectors. Quantification of the GAP elements is a challenge for the agricultural sciences.

Concluding Remarks

Good agricultural practices, in fact, link science and technology with practical agriculture, taking into consideration economic and ecological goals in order to secure the sustainability of agricultural production. GAP must be approached on the level of the whole country and regions as well as on the level of a single farm. Codes of GAP on the country level require a system of policies, laws, and regulations and, on the farm level, a system of education and advisory services and recommendations. Both systems have to be continually developed and introduced into Polish agriculture. The rapidity in progress towards GAP will depend on how clearly agricultural producers see their future as a function of more environmentally sustainable production systems. While the choice of technology is made on the farm, the factors that influence that choice are almost all beyond the control of the farmer. Nevertheless, there are many promising agricultural technologies currently available, or under development, that will make the production of agricultural goods more sustainable. There is good reason to expect that continued technological innovation according to GAP, combined with institutional and policy reform, can make agriculture a low-pollution sector that protects productive capacity and meets environmental objectives. Every farmer will make an individual choice of what goods to produce and what technological package to use, based on market prices and consumer preferences, agricultural and environmental policies, and available information on agricultural practices and farm-level resource constraints and potential.