2.3. Agriculture

European agriculture is extremely diverse, ranging from large, highly intensive and specialised commercial holdings to subsistence farming using mainly traditional practices. Consequently impacts on the environment vary in scale and intensity and may be positive or negative. There is a legacy of significant environmental damage associated with agriculture in central and eastern Europe, the Caucasus and central Asia (EECCA), often associated with unique ecosystems, where exploitation of resources (such as freshwater for irrigation) was excessive. The dramatic decline in resource use in these countries, largely due to economic restructuring rather than policy, consumer or technological developments, has scaled back many environmental pressures. However, land abandonment, undergrazing and lack of capital to maintain or improve farm infrastructure are creating new environmental pressures.

The common agricultural policy has been one of the important drivers of farm intensification and specialisation in the EU. Market pressures and technological development have also contributed to these trends which are very strong in some sectors that benefit from little public support (e.g. pigs, poultry, potatoes). Intensive farming has had significant impacts on the environment. Public concerns related to production methods and some reorientation of the common agricultural policy have created new opportunities, for example through labelling and agri-environment schemes, for farmers to reduce pressures on the environment.

For the countries of EECCA, the current window of opportunity for ensuring reduced environmental pressures from agriculture may not remain open for long. Agriculture in the central and eastern Europe countries is likely to intensify when they have full access to the common agricultural policy although there is an evolving agri-environmental policy framework and some opportunities under the special accession programme for agriculture and rural development to address this risk. The common agricultural policy will apply to new Member States in a modified form, which may reduce incentives for increasing production. There is little or no agri-environmental policy framework in the EECCA countries and few possibilities for farmers to address agricultural pressures on the environment.

2.3.1. Introduction

A common policy objective throughout Europe for several decades was to increase food production. Farmers increased agricultural output significantly between the 1940s and the 1990s in response to such policies. Supported by public investment, this resulted in mechanisation combined with the abandonment of traditional practices, reliance on non-renewable inputs such as inorganic fertilisers and pesticides, the cultivation of marginal land and improvements in production efficiency.

In western Europe (WE), the common agricultural policy (CAP) and several national policies encouraged intensification. This took various forms, including the sustained use of chemical inputs, increasing field size and higher stocking densities. Intensified farm management led to discontinuation of traditional fallowing practices and crop rotations resulting in a displacement of leguminous fodder crops with increased use of silage and maize. Specialisation and intensification have resulted in a decrease in the number of farm holdings and numbers employed, as well as a regionalisation of production leading to less diversity of local agricultural habitats.

During the socialist era in central and eastern Europe (CEE) and the 12 countries of eastern Europe, the Caucasus and central Asia (EECCA), government planning determined agriculture and food production with little regard to efficiency or the suitability of production for the environment. The area of land farmed and number of livestock in the former USSR increased as a result of land reforms which were started in the 1930s. The expansion of arable land at the expense of forest and grassland increased the pressure on remaining pastures. The development of huge irrigation and drainage schemes, farm specialisation and investment in animal production were all associated with the push to increase output, and resulted in a greater reliance on non-farm resources. For example the application of fertilisers nearly trebled and pesticide use doubled between 1970 and 1987 (Libert, 1995).

Further specialisation of EU agriculture is expected, but reforms of the CAP are likely to seek further integration of environmental measures into agricultural policy. Implementation of EU environmental legislation, such as the nitrates directive, is also expected to improve. Nevertheless, diverging input/output prices and high labour costs may prevent EU farming from reaching an environmentally sustainable level of intensity due to financial pressures. These trends are also likely to make it difficult for farming to continue the environmental management functions that it currently provides, for example for semi-natural grasslands or landscape elements. Thus, the environmental effects of EU agriculture will require continuing attention, beyond current policy initiatives.

The currently widespread low input and extensive agriculture in CEE provides a window of opportunity for the development of environmentally sustainable agriculture. Future EU membership could result in a return to more intensive agricultural practices unless policies are adapted to promote a more harmonious coexistence of farming with biodiversity, for example through agri-environment measures. There is a large untapped agricultural potential in EECCA that may give rise to intensification as their economies strengthen. For both CEE and EECCA, continued support is needed to integrate the environment into the agricultural sector. This would help to develop an agri-environmental policy framework, strengthen the agricultural advisory services, particularly in the provision of agri-environmental advice and training materials, and provide grants to improve or construct animal waste storage units. Improved monitoring and data are needed to enable a more detailed assessment of the impact of agriculture on the environment in Europe as a whole. For EU Member States and the accession countries, elements of such a monitoring system are under development, but measures should be extended, through cooperation, in order to ensure similar progress in EECCA.

2.3.2. Pressures on the environment

The extent and causes of the environmental impacts of agricultural practices vary significantly across Europe, notably by farm and crop type. Nevertheless, the continuing search for efficiency, lower costs and increased scale of production is resulting in substantial pressures on the environment, landscapes and biodiversity, particularly in the most intensively farmed areas. At the same time, agriculture remains essential to the maintenance of many cultural landscapes. This dual role is relevant throughout Europe, with farming systems of high nature value found mostly in areas with low input and more traditional agriculture.

Agricultural production throughout the continent continues to rely on non-farm resources such as inorganic fertilisers and pesticides. However, there has been a decline in the use of these resources and, particularly in EECCA and CEE, a reduction in the pressure on the environment.

While agriculture can exert significant pressure on the environment, it is also itself subject to negative environmental impacts linked to air pollution and urban development. Soil sealing by transport or housing infrastructure eliminates many thousands of hectares of agricultural land every year, in particular in WE (see Chapter 9).

Government programmes have a significant influence on the development of agricultural production capacity and intensity. A particular example of often large-scale public programmes to aid the farming sector is the management of water regimes through river regulation, wetland drainage and irrigation schemes. The development of irrigated area is described hereafter in Section 2.3.2.2. Drainage for agricultural purposes still affects several hundred thousand hectares of land throughout western and eastern Europe, leading to loss of biodiversity, water purification and retention capacity (IUCN, 1993). Though the amount of new drainage declined drastically throughout the region during the 1990s, existing drainage programmes continue to exert a negative impact on 15 % of all important bird areas in Europe (Heath and Evans, 2000).

2.3.2.1. Fertiliser and pesticide consumption

Enrichment of waters by nitrogen and phosphorous is widespread despite reductions in fertiliser use (Figure 2.3.1.). Diffuse losses from agriculture continue to be the main source of nitrate pollution in European waters as the treatment of sewage and industrial effluent has become very effective (see Chapter 8). For instance, more than half of all nutrient inputs to the Danube River were from agriculture (Haskoning, 1994) and fertiliser inputs to

the Danube basin will have to be maintained at about half of their 1991 levels in Bulgaria, Romania and Hungary to prevent further eutrophication of the Black Sea (WWF, 2000). Substantial amounts also enter the Baltic Sea from the nine bordering countries (Baltic 21, 2000). Chapter 8 describes the negative impact of phosphorus enrichment from diffuse agricultural sources on the water of eutrophic lakes in western and central Europe.

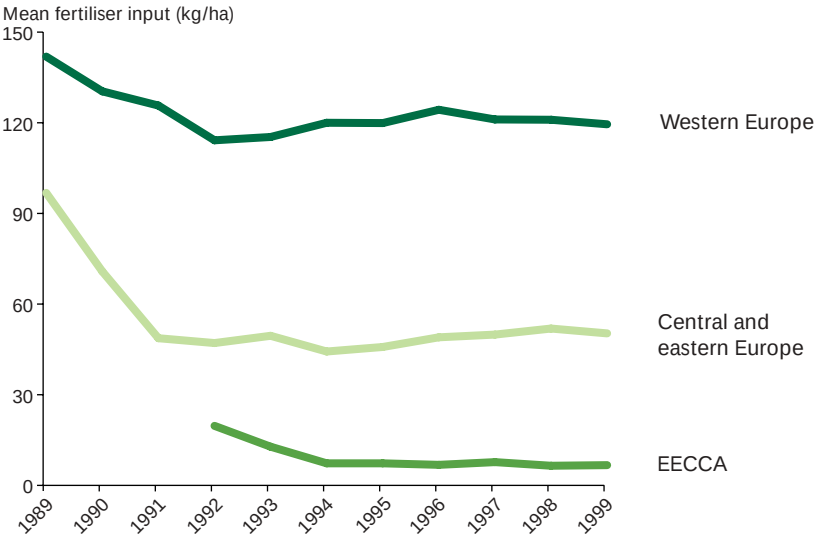
EU legislation, such as the nitrates directive (Directive EC 91/676), seeks to limit nutrient losses from farming to freshwater bodies by restricting nutrient use in designated nitrate vulnerable zones. However, more progress by Member States is required before this policy response can be considered fully satisfactory (EEA, 2002a). The decline in fertiliser use in CEE countries and EECCA is more attributable to reduced market opportunities for agricultural products, the declining profitability of agriculture, reduced state support and the widespread reorganisation of farming in the region. However, inorganic fertiliser consumption in CEE is expected to increase as a response to expected new market opportunities and integration with the CAP (EFMA, 2000).

Overall consumption of fertilisers has stabilised in recent years, following a significant decline during the first half of the 1990s in CEE and EECCA. Without appropriate management, current fertiliser input in western and eastern Europe may still be too high to be environmentally sustainable in the longer term.

Pesticides may pollute drinking water, surface water and groundwaters. Many groundwater supplies in EU countries exceed the drinking water directive (Directive 98/83/EC) maximum of 0.1 ug/l for a single pesticide (EEA, 2002b). Soils can also be affected: in Ukraine more than 20 % of the investigated agricultural lands are polluted by DDT and its degradation products, about 4 % are polluted by hexachlorine-cyclohexane (Ukrainian NCP, 2002).

New management practices, such as integrated crop management (ICM), have evolved as a response to the need to reduce dependence on pesticides (Figure 2.3.2.). ICM aims at environmentally sensitive crop management, including a reduced use of inputs, while maintaining agricultural productivity and profitability. Although covering only about 3 % of utilised agricultural area (UAA) in the EU, ICM encourages more targeted use and reductions in application rates of pesticides (see Box 2.3.1.) In EECCA and CEE, there are initial training programmes to support the uptake of ICM practices although the main reason for reduced pesticide use is economic restructuring. However, there is a significant environmental legacy in many of the CEE countries and

Fertiliser input per hectare of agricultural land in Europe, 1989–1999 — Figure 2.3.1.



Notes: Both fertiliser and agricultural area data are available for Estonia, Latvia, Lithuania and Slovenia from 1992; for Slovakia and the Czech Republic from 1993; and for members of the EECCA country group from 1992. The graph expresses total inorganic fertiliser consumption (N, P and K) per hectare of agricultural land (a complete time series of utilised agricultural area (UAA) was not available) for all countries with data.

Source: FAO

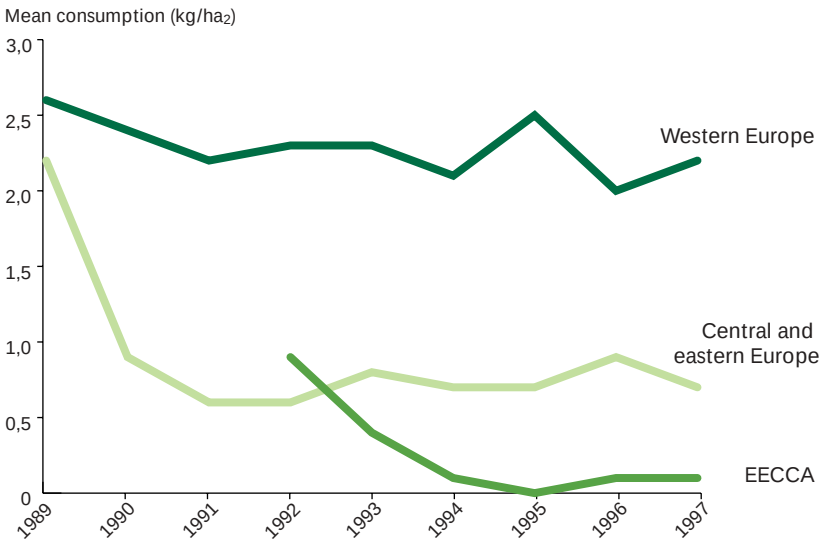
Box 2.3.1. Changes in pesticide use in Kazakhstan and the EU

Kazakhstan
The use of pesticides has been an important feature of agricultural production in Kazakhstan. The government financed pest control campaigns against exotic insects such as locusts and Colorado beetle. However, since 1992 farmers have had to buy the pesticides themselves and, due to economic circumstances, this resulted in a dramatic reduction in pesticide consumption. Between 1985 and 1997, pesticide input decreased from 0.57 to 0.13 kg of active ingredient per hectare. Despite the reduced pressure from pesticides their legacy persists, with many water courses, including the Syr-Darya, heavily polluted with DDT, DDD and DDE. The same is also true for large expanses of soil contaminated with organo-chlorine pesticides.

...and the EU
The integrated crop management concept is slowly gaining acceptance in the EU countries and integrated crop management methods are now applied on about 3 % of the utilised agricultural area. Evidence suggests that practising integrated crop management can lead to a reduction in pesticide leaching and, through general reductions in the application of pesticides, to a reduction in the risk of pesticide residues building up in the soil. Since integrated crop management systems promote a reduction in the use of pesticides and fertilisers, they are also likely to have positive side effects for biodiversity.

Sources: Pak, 1998 (Kazakhstan); European Commission, 2002 (EU)

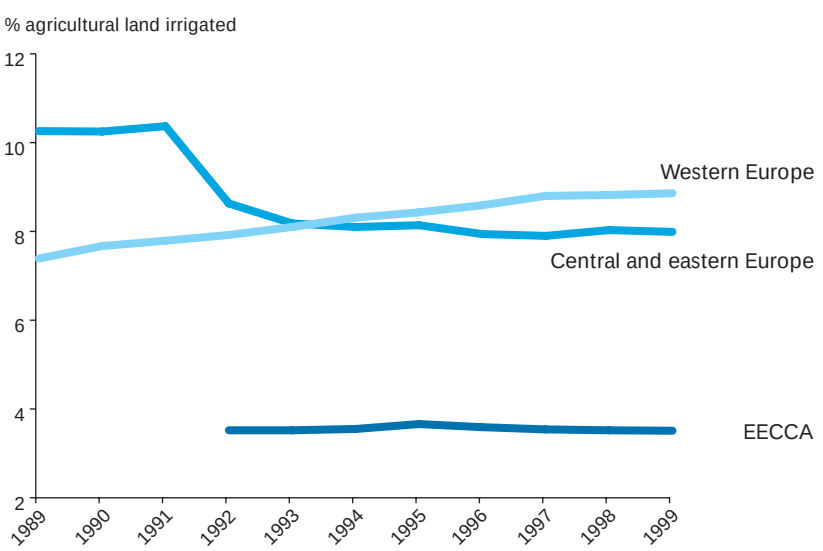
Figure 2.3.2. **Total pesticide consumption per hectare of agricultural land in Europe, 1989–1997**



Notes: The graph expresses mean consumption of pesticides (active ingredients classed as insecticides, herbicides, fungicides and others) as a percentage of total agricultural land (a complete time series of UAA was not available). The pesticide and agricultural land area dataset has an incomplete time series for all EECCA and CEE countries and for all WE countries except Finland and Denmark. Data for 1998 and 1999 are too sparse to be plotted on a country group basis.

Source: FAO

Figure 2.3.3. **Average irrigated land area as percentage of agricultural land area in Europe, 1989–1999**



Notes: The graph expresses total irrigated area as a percentage of total agricultural land (a complete time series of UAA was not available). No distinction was made between total areas equipped for irrigation and actually irrigated surface. Irrigated area data were not available until 1992 for Estonia, Latvia, Lithuania, Slovenia, Bosnia-Herzegovina, Serbia and Montenegro, FYR of Macedonia, Croatia and EECCA and until 1993 for Czech Republic and Slovakia.

Source: FAO

EECCA where localised hot spots of contamination are commonly associated with the storage and disposal of pesticides. For example, there are estimated to be up to 60 000 tonnes of obsolete stocks of pesticides in Poland, 20 000 tonnes in the Russian Federation and 15 000 tonnes in Ukraine (IHPA, 2001; see also: Danish Environmental Protection Agency, 2001; SYKE, 2002). Improved monitoring and disposal programmes for obsolete pesticide stockpiles are clearly required to avoid significant environmental problems in the future (see also Chapter 6).

The intensity of pesticide use has declined in many countries as a result of public environmental concern, legislation, economic pressures and the introduction of active ingredients with lower dosage requirements. However, much agricultural production still relies heavily on pesticide application to achieve higher economic returns.

2.3.2.2. Irrigated area

In southern Europe and central Asia, irrigation is essential for achieving economic yields and results in high water demand. In central and western Europe, irrigation is often used to ensure yields in dry summers. The largest irrigated areas are in the Russian Federation, Kazakhstan, Ukraine, Uzbekistan, Romania and Turkey. The scale and importance of irrigation in the EU is substantially greater in the southern countries but it is also significant in several northern regions. The irrigated area has increased most notably in France, Greece and Italy. There has been an overall decrease in the accession countries (see Figure 2.3.3).

Many heavily irrigated regions of southern and eastern Europe are characterised by a lowering of water tables, land degradation and desertification, salinisation and the destruction or degradation of wetlands and aquifers (see Box 2.3.2).

Irrigated land has a significant share of the agricultural area in western, central and eastern Europe. Substantial increases in irrigated area are still occurring in some western and Mediterranean countries. Eastern Europe, the Caucasus and central Asia has the largest area of irrigated land with serious implications for demand on limited water resources.

2.3.2.3. Livestock numbers

The total numbers of cattle, pigs, sheep and goats in CEE and EECCA have decreased; numbers in the EU have been nearly stable since 1990 (see Figure 2.3.4). High livestock population densities are associated with excessive concentrations of manure, leading to an increased risk of water pollution. In the EU, legislation and national programmes seek to minimise this problem with some success. Underdeveloped programmes and/or lack of legislative enforcement coupled with poor or non-existent containment of manure in CEE countries such as Poland (JRC, 2001) and Romania are still giving rise to localised hot spots of nutrient loading. This is also the case in EECCA, particularly in Belarus and regions of Ukraine and the Russian Federation specialising in animal production.

The loss or intensification of traditional extensive livestock grazing systems has had particularly negative effects on biodiversity. Overgrazing in certain vulnerable environments (such as parts of the UK uplands and heather moorlands) has damaged these habitats. The contribution of livestock to gaseous emissions is also significant: 94 % of total EU ammonia emissions (from housed animals) and 49 % of total methane emissions arise from animal husbandry (EEA, 2002c).

Livestock production in the EU has become more specialised and intensive. Overstocking can be attributed partly to the provision of production incentives, including payments per head of livestock under the CAP, although socio-economic drivers have also encouraged some regionalisation of livestock production and localised overgrazing.

😐 Livestock numbers fell markedly between 1989 and 2001 in central and eastern Europe, the Caucasus and central Asia. However, high pressures on the environment from intensification and the concentration of livestock production in large units with poor animal waste management persist, especially in eastern Europe, the Caucasus and central Asia and the accession countries.

2.3.2.4. Biodiversity and semi-natural grasslands

Much of the biodiversity in Europe is found on or adjacent to farmland and is therefore considerably affected by agricultural practices (see also Chapter 11). Agricultural

Box 2.3.2. Irrigation issues

Southern Europe

Arable production in Spain has become more intensive through the expansion of irrigated crops, resulting in a loss of dry-steppic habitats, traditional dryland crops, and breeding areas for birds such as the great bustard (Otis tarda). In spite of recent reductions in water use (see Chapter 8, Figure 8.3.), the wetland area of Las Tablas de Daimiel, which is a Natura 2000 and Ramsar site, has been reduced by 60 % as a result of agricultural overexploitation of the aquifer that feeds the La Mancha wetlands. Salinisation of the subterranean water and contamination and eutrophication of the surface water has also occurred, in addition to a reduction in nesting areas due to changes in vegetation, including peat fires, and land subsidence.

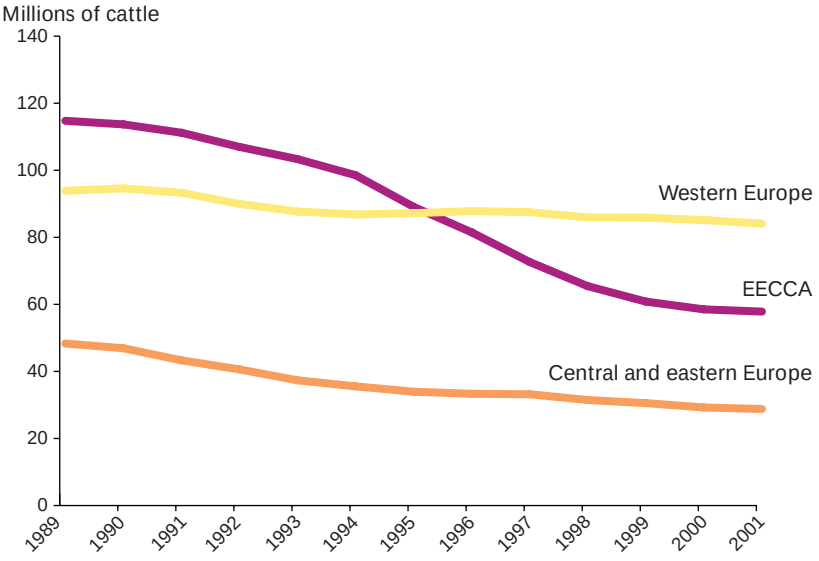
Central Asia

Central Asia, under the former USSR, was allocated the role of raw material supplier, principally cotton. An extensive irrigation scheme encompassing the Amu-Dar and Syr-Dar river catchments was undertaken to ensure competitive yields. The irrigated area increased from 4.5 million ha to 8 million ha between 1960 and 1995. Among irrigated crops, cotton has the highest requirement of freshwater per kilogram of product. In Uzbekistan, freshwater consumption by agriculture amounted to 84 % of total water use in 1989, largely attributable to cotton production.

Drainage systems are used to avoid water-logging and salinity of soils, and the fields are irrigated with additional freshwater to remove salts from the soil. The returned salt-contaminated drainage water contains pesticide residues and fertiliser and has a severe impact on rivers and wetlands. The traditional ecosystems of the two deltas of the Amu-Dar and Syr-Dar have perished and the Aral Sea is drying up as a result of excessive water demands. Since the 1990s, some initiatives have been under way to improve the environmental and water management in the Aral Sea catchment area. For various reasons the area planted with cotton has also decreased during the same period, although Uzbekistan is still one of the largest cotton producers in the world. However, the environmental situation in and around the Aral Sea remains very serious (See Chapter 8, Box 8.1. and Chapter 9, Box 9.2.).

Sources: Baldock *et al.*, 2000 and WWF, 2000 (southern Europe); http://www.fao.org/ag/AGL/aglw/aquastat/regions/fussr/index.htm and WWF, 1999 (central Asia)

Number of cattle in Europe, 1989–2001 Figure 2.3.4.



Note: Similar declining trends are reported for pigs, sheep and goats in CEE and EECCA, while in the EU there was little net change in pig, sheep or goat numbers.

habitats support the largest number of bird species of any broad habitat category in Europe, including the greatest number of threatened species (Heath and Tucker, 1994) (see Chapter 11). Species dependent on farmland are, however, threatened by changes in management practices, such as the time of sowing and harvesting of crops, intensification, abandonment, loss of field boundaries, conversion of grassland into arable land (see Box 2.3.3), and a decline in habitat diversity due to increased mechanisation (Nagy, 2002).

The surviving natural steppe grasslands in EECCA remain threatened by conversion to arable land and by local overgrazing, but the collapse of many collective farms has led to the re-establishment of communal, semi-subsistence pastoral systems. This extensive land use favours the maintenance of biodiversity-rich semi-natural grassland systems that depend on traditional grazing and/or haymaking. Case studies from Ukraine and elsewhere show the high plant and butterfly diversity of such systems, most of which has already been lost in WE (Elligsen *et al.*, 1998).

Box 2.3.3. Agriculture in semi-natural grasslands

Due to the relatively small area of undisturbed natural habitat that remains in Europe, semi-natural habitats are particularly important for nature conservation. Semi-natural grassland depends for its maintenance on appropriate management by farmers through mowing and/or grazing, and is therefore particularly sensitive to intensification or abandonment. The area of semi-natural grassland has fallen in recent decades across Europe. In the United Kingdom, for instance, semi-natural acid grassland declined by 17 % between 1990 and 1998 in England and Wales (DEFRA, 2002). In spite of the generally extensive nature of agriculture in Finland, many areas of semi-natural grassland have been converted into arable land. Thus, the area of hay fields fell from 13 000 ha in 1970 to just 6 000 ha in 1997 (Pitkänen and Tiainen, 2001).

The proportion of semi-natural grassland in CEE and EECCA is high relative to most EU countries, and the total area far exceeds that in the EU. However, agriculture has become significantly more intensive and, in Turkey for instance, the area of steppe grassland fell from 60 % to 31 % of total agricultural land between 1950 and 1984. Some central and eastern European countries have a relatively high proportion of semi-natural grassland, for instance in Slovenia it amounts to more than half of the UAA (Veen, 2001).

Such habitats will, however, come under considerable pressure if agriculture becomes more intensive, giving rise to significant biodiversity loss (Donald *et al.*, 2001). On the other hand, land abandonment is currently a bigger problem in the region, and is likely to remain so during the transitional years after EU membership. In Estonia, for example, about 30 % of the 1.5 million ha of farmland is currently abandoned (Estonian Ministry of Agriculture, 2001). This proportion is even higher for permanent grasslands (56 %). Among semi-natural grasslands of medium or high nature value (37 000 ha), only 40 % is still under management (Mägi and Lutsar, 2001).

Table 2.3.1. **Estimated distribution of agricultural areas, permanent grassland, semi-natural and natural grasslands in CEE countries in 1999**

Country	Total utilised agricultural area (UAA)	Total area of permanent pasture	Total semi-natural grassland area	Total mountain grassland area	Semi-natural grassland in total UAA
	(ha)	(ha)	(ha)	(ha)	%
Bulgaria	6 203 000	1 705 000	444 436	332 071	7.2
Czech Republic	4 282 000	950 000	550 000	1 750	12.8
Estonia	1 434 000	299 000	73 200	0	5.1
Hungary[1]	6 186 000	1 147 000	960 000	0	15.5
Latvia	2 486 000	606 000	117 850	0	4.7
Lithuania	3 496 000	500 000	167 933	0	4.8
Poland	18 435 000	4 034 000	1 955 000	413 600	10.6
Romania	14 781 000	4 936 000	2 332 730	285 000	15.8
Slovakia	2 443 000	856 000	294 900	13 100	12.1
Slovenia	500 000	298 000	268 402	29 822	53.7

Source: Adapted from Brouwer *et al.*, 2001, on the basis of FAO data; data for Hungary: Demeter and Veen, 2001

In CEE and EECCA the status of farmland biodiversity is better than in the EU although a problem is emerging with land abandonment and undergrazing. This is resulting in forest and shrub encroachment on flower-rich grassland areas and a consequent loss in biodiversity. In general, it may be assumed that land abandonment affects semi-natural grasslands and other extensive farmland important for biodiversity more often than the available land abandonment data suggest.

Semi-natural grassland can also be threatened by conversion to arable land. In Hungary, a return to private ownership and market pressures have provided an incentive to convert extensive semi-natural grassland ('puszta') areas to the production of cash crops such as maize and sunflowers. A comparison of maps and satellite images for the area between the Danube and Tisza rivers (about one sixth of the country) showed that 44 000 ha of such grasslands were lost between the mid-1980s and 1998 (Molnár and Vajda, 2000). Conversion to arable land is a continuing threat to the high ecological value of semi-natural grasslands in a country which still harbours the great bustard (*Otis tarda*) and imperial eagle (*Aquila heliaca*), among many other species.

2.3.3. Policy response

Recent shifts to environmentally friendly production systems, such as organic production, are apparent and contribute to reducing agriculture's dependence on external chemical inputs. Organic farming covered about 3 % of the total agricultural area of the EU in 2000. The development of certified organic farming in the accession countries and EECCA still lags significantly behind this figure (EEA, 2002a) in spite of a high share of low-input systems that could facilitate such a shift.

Reforms of the CAP (e.g. in 1992 and Agenda 2000 of the European Union) aim to shift the emphasis of the policy from market-based support (e.g. intervention to maintain producer prices) towards direct income support (e.g. payment per hectare or unit of livestock). These changes, together with public concerns related to production methods, have encouraged the EU to provide new opportunities to finance agri-environment schemes as part of rural development programmes. These are obligatory under the EU rural development regulation (Regulation 1257/1999) and take up about 50 % of planned rural development expenditure in the EU Member States in 2000–06. By 1998, such schemes already covered more than 20 % of the agricultural area of the EU although farmer participation varied greatly between countries and did not necessarily coincide with the areas of highest environmental value or need (Petersen, 1998).

Throughout CEE and EECCA, increased environmental awareness and recognition of the complexity of rural socio-economic problems is apparent, but agri-environmental policy development is still at an early stage. There are also significant regional disparities, with accession to the EU being a major influence on agricultural policy and activities in all accession countries. Pre-accession instruments, notably the special accession programme for agriculture and rural development (SAPARD) are assisting this process in CEE countries although most countries have chosen to give higher priority to improving the competitiveness of the agri-food sector than to agri-environment measures. Nearly all CEE countries included agri-environment measures in their proposed SAPARD programmes, but there have been considerable delays with implementation, and some countries have abandoned the measure altogether. The obligation to implement EU legislation such as the water framework, nitrates, birds and habitats directives after accession will, however, make it necessary to integrate environmental considerations into agriculture policy.

For EECCA, it has been market reforms, rather than agri-environmental policy or the integration of environmental actions into the agricultural sector that have been the principal drivers of change. Many of the international financing institutions cooperate with EECCA in providing grants and loans to develop strategies and actions to mitigate the impacts of agriculture on the environment.

The situation in the Mediterranean accession countries is different, with wide variations in the economic significance of agriculture, production patterns and environmental problems. Unlike CEE and EECCA, which have gone through major reductions in the use of inputs, one of the main issues for Cyprus, Malta and Turkey is prevention or control of the detrimental

effects of likely future agricultural development on water resources and other aspects of the environment. Few agri-environment initiatives have been established in these countries, partly because so far they have not been eligible for EU funds for developing agricultural methods that protect the environment.

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