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The ecological consequences of privatisation in Romanian agriculture

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ABSTRACT: There have been many changes in the vegetation cover as a result of the development of settlements and agriculture. Every change in the farming system will be reflected in some ways in the vegetation; and some of these changes may be ecologically undesirable. For example erosion may accelerate as a result of cropping and overgrazing on steeply-sloping hill land with thin soils. Several changes were apparent when agriculture was collectivised and a further transformation is now under way as a result of the privatisation of agriculture and the transition to a market economy. The recent changes are outlined, against a background review of the earlier transformations. Although the situation will only become clearer as the transition proceeds it is evident that ecological problems will have to be given a higher priority.

Introduction

Today about a third of Romania is intensively-farmed lowland country while the other two-thirds of Romania consists of hills and mountains with a natural and semi-natural vegetation on ground used mainly for forest, grazings, hayfields or orchards. The vegetation is in a state of equilibrium in relation to the anthropic pressure although there is a risk of mass movement and gully erosion given the steep slopes and friable substrata. However when social and economic transformations occur and the system of landuse changes there are inevitable consequences for the environment which can be seen through changes in the relations between infiltration, run-off and evaporation. All this has implications for the soil conditions, the erosional processes and the suspended load of rivers.

Historical perspectives

In the past about three-quarters of Romania was covered by forest while the rest consisted of steppe/silvosteppe grassland, wetlands and subalpine/alpine zones. But forest began to diminish in Neolithic times and the process has continued, with extremely high rates of decline in the nineteenth and twentieth centuries when population increased rapidly and when there were additional incentives to clear more farmland to boost cereal exports when the Turkish trade monopoly ended. Slopes became severely eroded and the consequences are still very clear today, despite some excellent works of protection. Former forest is now used as pasture and the land is frequently over-grazed: in the hill country mesophile vegetation has given way to secondary xerophile or xeromesophile formations with meadows dominated by *Festuca valesiaca* or *Botriochloa ischaemum*. Meanwhile steppelands previously subject to grazing at moderate intensity are entirely cultivated and most wetland has been put to agricultural use. The subalpine zones with light woodland have become secondary pastures.

Some important transformations occurred in the 1950s after the nationalisation of estates and the collectivisation of agriculture reduced the connection between rural communities and their land and stimulated many people to take work in the towns (accompanied by either a definitive migration or by daily commuting from the villages). The vegetation was affected through the reduced population pressure in areas too remote for commuting to work in the towns to be feasible. With a low intensity of grazing there was some recovery of the plant cover (with a growth of weeds and bushes) and reduced erosion. In some cases pastures were planted with erosion-resisting trees and in some hilly areas, where people used to cultivate maize, potatoes and vines on sloping land, it was common find the cooperative farm man-

agements to establish hayfields and orchards, thereby reducing the level of erosion.

But usually the pressure was increased, with village commons frequently turned into arable land or modern orchards. In regions specialising in viticulture state farms operated more intensively. And many forest glades or enclaves were taken by the state and planted. Pastoral pressure therefore increased on the remaining land available, usually steeply-sloping ground with thin soil. The result was severe degradation of the structure and composition of the vegetation and greater erosion; aggravated by a proliferation of paths and cart tracks. Corrective works were only rarely carried out where incipient erosional forms occurred. Meanwhile grazing in the forests damaged young trees. Belatedly the authorities implemented programmes to cope with erosion over extensive areas of degraded land: they were usually well-conceived, although they were implemented by enterprises which had no contact with the local farming population and by specialists with no personal interest in the results. An assessment of the environment in 1989 (Rauta and Carstea 1990) revealed that erosion affected five million hectares and landslides another 0.7 million.

Irrigation schemes were implemented in the lowlands, using the water of the Danube and the inland rivers (also some underground sources) to supply an area of some 2.5 million hectares. These projects have been quite essential to maintain steady yields in the southern and western lowlands. However, the linkage of salaries with volumes of water consumed made for over-irrigation in some cases. But the problems of the 1980s have been increased by the collapse of the planning due to the reorganisation of former cooperative farmland. Higher energy costs for pumping cannot be sustained and the effective irrigated area has been reduced. Moreover, poor management has led to salinization over some 25,000 hectares. However, the problems with irrigation are not simply due to economic change. Aridity ("aridizare") has become more pronounced during the late twentieth century through deforestation, erosion and farming. Difficulties with the irrigation systems coincided with a succession of dry years when higher temperatures have combined with lower rainfall and reduced winter snowfall. Much of Romania is finely-balanced between water deficit and surplus, so a relatively slight change can lead to a major extension of deficit areas towards the north and west.

Another long-term problem is the deterioration of the soil structure, especially in the lowlands. Irrigation is partly responsible but other facets of intensive modern agriculture should also be mentioned: monoculture and an increased use of chemicals (fertilizers, herbicides and pesticides), especially on the state farms. Although the underlying principles are sound there have been difficulties arising from the small proportion of organic fertiliser and from inappropriate applications of chemicals: random sprinkling could cause weeds to grow excessively and the depredations of pests to increase, to say nothing of increased soil pollution (now a problem over some 0.90 million hectares – and a severe problem in the case of 0.20 million). The introduction of heavy machinery led to the problem of "hardpan" over some 6.5 million hectares. Over half the agricultural production was being achieved at the expense of the soil reserves: with depletion of the humus content, reduction of soil nutrients and degradation of the structure.

Changes associated with the current economic transition

This transition is under way but it is difficult to see the environmental effects clearly because agriculture is still quite disorganised (Ianos et al. 1992). Cereal yields are affected by shortcomings in farming methods and also by the malfunctioning of the irrigation systems for various reasons discussed below. The situation was difficult for agriculture and particularly serious in the context of the drought which affected the southwest in 1993. Especially in 1993 considerable areas of cereal land were not sown. Individual farmers and family associations lack the financial means to buy equipment and chemicals. So the technical level has fallen with greater dependence on horses and other draught animals (even cattle and donkeys) at the present time: a situation which is environmentally friendly although hardly an acceptable basis for the future. 1995 was a much better year with high yields of wheat and barley secured followed by good results for maize and sunflowers in comparison with 1990–4. However, smaller and lighter machines are needed: they will be appropriate for use on smallholdings with a diversity of cultures and will bring permanent ecological benefits now that the parcelling out of the cropland has hampered the use of heavy tractors and harvesters, although these remain appropriate for use by agricultural associations which are prominent in the lowlands. Several factories have been reprofiled to produce machines for small farms but money is short. More education over the use of chemicals is needed, but an important trend of environmental significance is the emphasis on livestock which is resulting in an increased amount of organic fertiliser and the cultivation of some leguminous plants for fodder. This is an efficient way of increasing soil fertility and controlling the spread of weeds (which in turn allows a reduction in the use of pesticides). Vines are also being established on small farms.

The situation is complicated in the case of irriga-

tion systems which previously covered large areas belonging to different state and cooperative farms. The former systems of coordination have collapsed with the break-up of the cooperative farms while equipment has been broken or stolen in some places. Even the concrete blocks and flagstones lining the irrigation canals have disappeared. This is serious because of the increasing water losses: high in any case (for as much as a third of the water was lost by infiltration) because of defective construction work. Water costs are too high for individual farmers to contemplate, but on the other hand where the canals run close to villages (as at Galicea Mare in Oltenia or Stefan cel Mare in Baragan) water can easily be abstracted illegally and produce good crops on the smallholdings. The shortcomings over the irrigation systems have been particularly unfortunate in view of the intense drought referred to on the plains in 1993 which meant disappointing results for summer crops (barley and wheat) and even greater problems for the autumn crops (maize, sunflowers and vegetables such as tomatoes). As already noted however the 1995 situation was much better.

In hilly and mountainous areas it is important that the variations in carrying capacity should be noted since the environmental conditions are often critical (Zavoianu et al. 1993). In some such areas private farms survived under communism and the independent outlook of the peasantry is a source of stability. But elsewhere there is a danger that new farmers with little experience could make mistakes and plough along the slope instead of transverse to it (an important matter where a torrential rainfall regime is highly conducive to erosion). More use is being made of traditional plum orchards in the hills (a source of both hay and fruit) while mountain hayfields are being worked from secondary farmsteads ("conace" or "salase") with some cropping at the same time. These are satisfactory ways of making better use of land situated a long way from the village: more fodder is made available for sheep which combine grazing around these hayfields in spring and autumn with summer grazing on the high mountains and accommodation in the village (or at the secondary farmstead where hay is stored) in winter. But it is a questionable practice for farmers to grow maize and potatoes on land used only as hayfields by the former cooperatives: the results are generally poor, with risks of erosion which may then affect other surfaces through regressive erosion and the transport of the material downstream (where it accumulates on river beds or in reservoirs).

Meanwhile the traditional interest in livestock is resulting in improvements to the meadows, especially where farmers are acquainted with traditional practices and ensure a dressing of organic fertiliser through the controlled grazing of cattle (Turnock 1993). The clearance of scrub from meadows is often desirable though it can be dangerous where the potential is low (through thin soils and rock outcrops): bushes, which survive from the cutting of forest, open woodland or dwarf pine associations, play a major role in the control of erosion and the regeneration of the soil cover on eroded lands. Removal of buckthorn scrub (*Hippophae rhamnoides*) has reactivated erosion in some cases. A problem with livestock is the proliferation of paths arising through the failure to keep to specific routes in open country. Erosion is encouraged, especially in the case of cart tracks. The number of paths and tracks is now being reduced and simple but efficient methods of preventing erosion are being used (for example the fencing of plots with scrub hedges can be very beneficial).

It should always be remembered that, while mountainous areas are suitable for pastoralism, there is a danger of overgrazing which will result in the invasion of low-productive herbaceous associations (*Nardus stricta* or *Deschampsia caespitosa*). Often on deforested land there are now dwarf bushes (*Juniperus communis* ssp. *communis*/ssp. *nana*, *Vaccinium myrtillus* and *Brukenthalia spiculifolia*) which represent disclimax associations with less ecological value. Overgrazing and suppression of this vegetation can lead to erosion (especially where there is scree and rock outcrops) and once the soil is destroyed it takes a long time to recover because pedogenetic processes work much more slowly than in the lowlands. The growing season is short and the temptation to increase growth through the use of chemicals creates dangers of water pollution since the source areas of rivers are involved (Rey 1979). The importance of an ecological approach to farming in the Carpathians is underlined by the importance of agrotourism which could contribute significantly to farm diversification and pluriactivity in the Brasov area and in the Dambovita, Ialomita and Prahova valleys close to Bucharest.

A case study: The Subcarpathians of Buzau County

Although the area has offered security in the past and continues to support a substantial rural population today, through the economic benefits of the woodlands and minerals as well as the agricultural potential, it requires particularly careful land management on account of the hazards of gully erosion, landslides, mudflows, floods and even earthquakes (Balteanu 1983; Zavoianu 1989). The scope for farming is limited by the low fertility of the soils: regosoils, young pseudo rendzinas and even younger rendzinas, which, along with rock outcrops, cover nearly a third of the area. But geology also imposes restrictions through the presence of salt marls from which

the thin soil layer has been almost totally removed; so that considerable areas have fallen into disuse (Muica et al. 1981). The area covered by Candesti gravels is highly permeable; so the thick and highly-fragmented sediments are not endowed with any significant accumulation of underground water.

Then there are geomorphological processes which operate in the context of a precarious state of equilibrium. Mention should also be made of the relief fragmentation, the high drainage density (four to six kilometers per square kilometer), the relief energy (100–500 m) and the steep slopes which diminish the length of overland flow and accelerate the formation and transmission of floods with attendant problems of erosion. In addition there is gully erosion, exemplified by cart tracks on the hillsides which have cut deeper and deeper into the ground and eventually become impassable. The mean specific discharge of suspended sediment load amounts to 13.0 tonnes per hectare across the Buzau Subcarpathians as a whole. But this figure rises to 39.6 for the Slanic Valley and 55.4 for the Calnau Valley. Studies made on arable land growing maize indicate soil losses 26.6 tonnes per hectare on slopes of 18 degrees and 51.5 tonnes on steeper slopes of 28 degrees. The losses are much lower in the case of stalky cereals: 7.0 and 12.8 tonnes per hectare respectively (Ene 1987). Protective work is obviously very necessary and since regaining their land peasants have begun to construct buckthorn hedges to control erosion (Turnock 1991).

Climatic conditions are significant generally in terms of the temperature requirements of particular cultures; but there are complications arising through temperature inversions which increase the risks of frost damage. Late frost in spring when fruit trees are in blossom can result in heavy losses while early frosts in the autumn can also cause extensive crop damage. Extremes of precipitation are again highly dangerous for prolonged drought will reduce output on all types of land while heavy rain (though conducive to growth of grass and other crops) increases the risk of landslides and mudflows. Heavy rain not only induces erosion but degrades soils in relation to the quantity of suspended load which will be particularly high on arable land lacking a vegetation cover. The risks are extremely high in July when very heavy storms can occur: 225 mm of rain was recorded at Patarlagele in July 1975 (including 124 mm in a single 24 hour period; and a maximum intensity of 1.4 mm per minute). Looking at torrential rainfall charts we can see that several torrential-nuclei, followed by rains with one nucleus placed at the beginning of the fall, are characteristic for the region (Muica et al. 1979).

Relief and climate together give rise to several forms of mass movement which constitute a major "fact of life" for the population of the Subcarpathians when they work in agriculture and invest in buildings. Landslides – old or new; fixed or active, mudflows and other processes of mass movement occur on four to five degree slopes formed on clays and marls. They are almost impossible to control, being a function of the complex geology and the instability arising from the continuing tectonic activity. Extensive landslides can be seen in the Calnau and Ramnicu Sarat basins and elsewhere. Some individual cases are quite dramatic. In March 1973, after six months of heavy rain, landslides developed close to Tega village. The slides began on the upper slopes to the left of the Buzau river and carried away about 2,000 tonnes of material. Being unbalanced a landslide 12 meters deep quickly developed on the lower slopes and completely destroyed ten houses in the village (Balteanu 1983). Again, in the Fantanii Valley, within the Panatau basin, a landslide has been nourished by a massive bed of sandstone (30–40 m thick), developing over a length of 370 m and width of 300 m.

Torrential rain and heavy run-off also gives rise to major flood hazards. In July 1975 the discharge of the Buzau river reached 1,400 cubic meters per second at Nehoiu (in the mountain zone) and 2,100 cubic meters per second at Magura in the heart of the Subcarpathians. There were serious floods, coming only a few years after the previous (slightly less disastrous) floods of 1969 and 1972. Along the Buzau and the tributary rivers crops were destroyed and the arable land on the flood plain was covered by a thick layer of sand and gravel. It often happens that fertile soils lying at the foot of a slope or at the contact between slopes and terraces are covered by material washed down the slopes, while further problems arise with the deposition of material in areas of slope declivity change. In both instances land fell out of agricultural use and recovery took a long time. Damage also occurred to transport with the railway undermined at Paltineni in 1969 and in 1975: almost the entire network of bridges and footbridges, spanning small watercourses, was swept away. During the 1975 flood suspended load amounted to 16.7 kilograms per second at Nehoiu and 51.2 at Magura: an increase of more than three times while the water discharge increased only by half. In the case of rivers rising in the Subcarpathians there are particularly high turbidity rates with 47.2 and 31.2 kilograms per cubic meter respectively for the Calnau and Slanic rivers. During flood values will be even higher: measurements made in a basin of 20 square kilometers at the height of a flood of medium intensity, with rain falling on clays and marls, revealed a maximum turbidity of 472 grams per liter (Zavoianu 1986).

Fortunately the risk of serious flood damage has been greatly reduced by the completion of the barrage at Siriu, above Nehoiu. Yet the area remains highly unstable and land use practices need to be included in a programme to manage the environment on a sus-

tainable basis. Landslides and mudflows together may affect up to sixty percent of the sloping land, as in the Balaneasa and Bisca Chiojd basins where there are depressions developed in marls and clays. Damage occurs to buildings and roads, as well as agricultural land on which only grazing and hay-making may be possible. Indeed, some entire hill slopes can no longer be cultivated. And although stabilised landslides may be used for agriculture (and may even offer the advantage of moist young soils) the risk of possible reactivation cannot be overlooked. When whole settlements are driven on to such surfaces (given the lack of flood-free terraced land, especially in the secondary valleys) the dangers are especially serious. Further research is being undertaken to establish the potential of different areas. Detailed investigations were carried out over a sample area of 175 sq km around the Patarlagele research station. A mosaic-like distribution of soil types was revealed and it was possible to recognise five levels of natural potential: very good (7.3%), good (20.4%), average (50.3%), poor (7.8%) and very poor (14.2%) (Figure 1). The pattern reflects the complex geology with varied structural characteristics and lithological sequences, often affected by landsliding. Local variations also rise through the presence of terraces, floodplains, alluvial fans and sliding glacis. It is important that farmers should carry out their activities with these varied potentials in mind. The results of the research should be more widely disseminated and agricultural advisers are needed to help farmers consider the implications for their own holdings.

Conclusion

Privatisation of agriculture is leading to changes in the vegetation and sometimes these changes are ecologically undesirable. Although particular problems may not be widespread (with clear regional variations) it is necessary to monitor the situation and thereby obtain an accurate picture which could be the basis for more environmentally-friendly farming methods. For the moment the economic hardships of the transition and its administrative deficiencies are limiting the degree of concern over ecological problems and some positive results have occurred only as a consequence of reduced agriculture pressure deriving from economic constraints. It remains to be seen how the transition will unfold and how economic and social life will evolve. But ecological

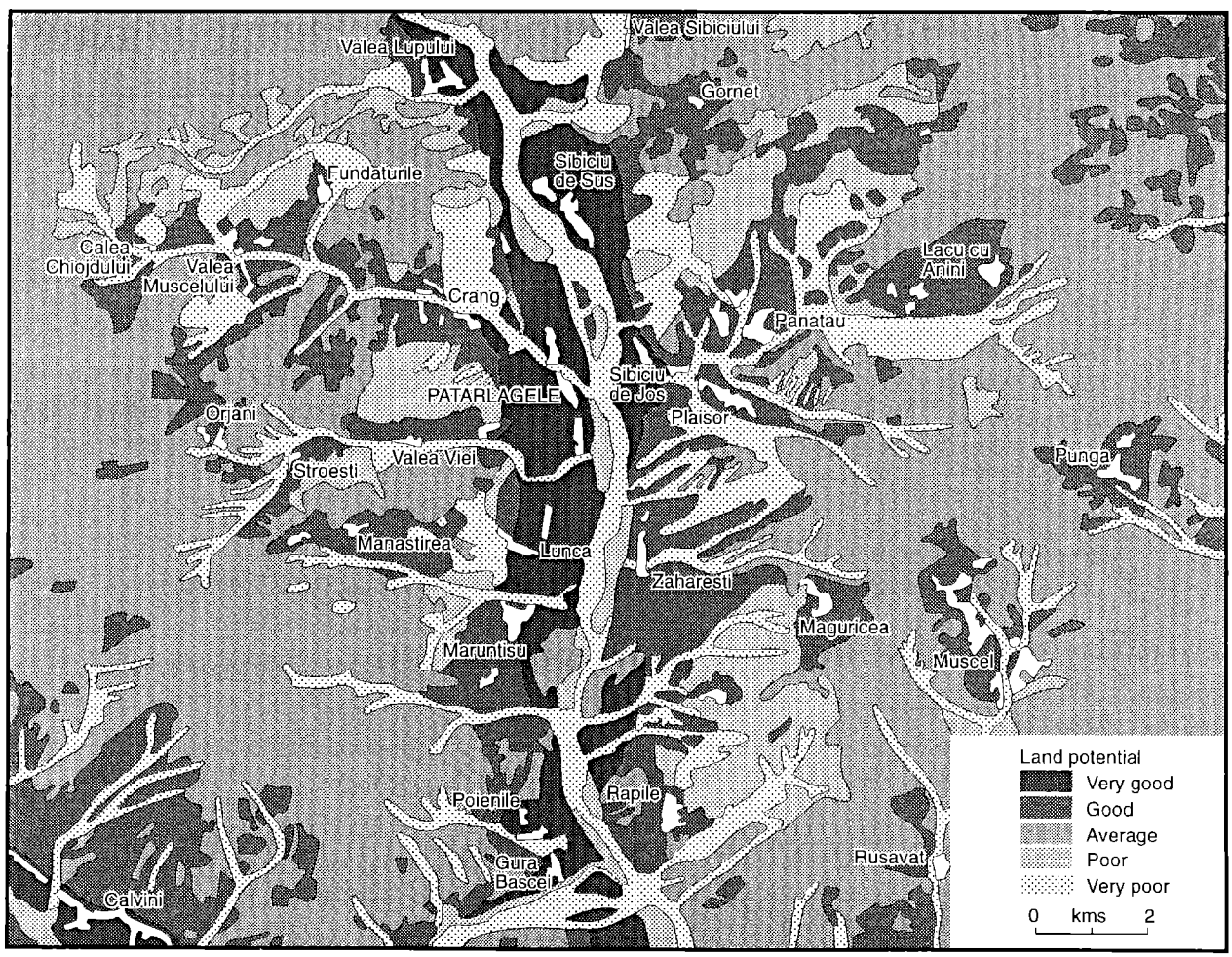

Figure 1. Natural potential of the environment in the Patarlagele area.

considerations remain important and more effort is needed to discuss potentially serious changes in vegetation, especially in areas where environmental stability is most threatened. In the case of the Buzau Subcarpathians it is particularly important that the new farming system should attach priority to environmental protection. Scientific research is certainly needed to monitor the changes in the environment and to recommend appropriate conservational measures.

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