ACHIEVEMENTS AND PERSPECTIVES IN IMPROVING AND USE BY FORESTATION OF DEGRADED LANDS IN VRANCEA

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ABSTRACT

The works presents the results and the efforts done in the Vrancea region with forestation of degraded lands. Due to natural causes: lythological substratum, slope and human interventions lands (eg. intensive grazing, aforestation) there were some 15.000 ha of degraded land. Different technologies were developed to install forest including: torrent correction works, ensure slope stability through works of consolidation, choosing and using different species of trees and shrubs. after 25 years the improvement can be seen: land degradation stopped on 90-95% of area, the pedogenesis process has restored, discharges of ground water reduced.

Key words:land degradation processes, Vrancea Region erosion controll, forestation of degraded land, landscape rehabilitation, protective forest cultures

NATURAL AND SOCIAL-ECONOMIC CONDITIONS THAT LEAD TO LAND DEGRADATION IN VRANCEA AREA

The natural conditions are most favorable to land degradation: the lythological substratum is mainly clay marl or sandstone marl, high fragmentation of relief, high relief energy, aso, associated with uncontrolled human interventions highly intensive especially in the second half of the 19th century, on the vegetal and soil cover, by reduction of forest-covered areas and improper use of the land (intensive grazing, fallowing of steep slopes, aso) have lead to intensification of erosion processes and gravitational

shift in the Curve sub-Carpathians, as compared to the Vrancea sub-Carpathians*.

Beside the diminishment, sometimes almost loss of the productive capacity of the soil, land degradation lead to irregularities in the ground and underground water flow system, changes in the microclimate and serious landscape destruction.

The many negative effects generated by the land degradation processes and intensification of the torrential feature culminate with the torrential high flood waves which cause significant damages by destroying different facilities: transportation facilities, human settlements, agricultural crops. Very significant damages occur due to the degradation of agricultural and forest lands and due to crop destruction caused by high floods. Degradation and disturbance of the physical-biological soil functions lead to loss in their productivity between 20 and 100%.

The unwanted experience on land degradation in Vrancea has also shown that by losing the water retaining a storing capacity with 20-90% the result is the aridization and desertification of lands where the soil is washed out, while the torrential processes intensify.

In order to stabilize the degradation and to alleviate torrential phenomena, big torrent correction works and degraded land forestation have been performed. The rehabilitation of the degraded lands became real through the forestation of more than 11,000 ha of such lands. As a result of the forestry improvement and hydrotechnical operations, the degradation processes were stopped in the lands subjected to such operations, the torrential outflow were reduced and the sediment transportation was considerably diminished in the watersheds.

Unfortunately, the high propensity for land degradation leads to the perpetuation of the erosion and land sliding in the area and the lack of possibilities to apply suitable preventive measures for soil protection against erosion and the reduction of financial funds for torrent correction in watersheds leads to the continuous increase of degraded land areas. Recent mapping performed by the office of Pedological and Agrochemical Studies-Vrancea shows the existence of about 49.2 thousand hectares of lands with strong or very strong degradation (17.44 thousand hectares lands with strong erosion; 16.7 thousand hectares lands with very strong erosion; 2.3 thousand hectares lands with excessive erosion; 3.6 thousand hectares lands with gullies and 9.2 thousand hectares lands with sliding).

As a consequence, it has been estimated that in the near future 15 thousand hectares of degraded lands need to be forested under harsh to extreme site conditions.

Therefore, in the area considered, due to favorable natural conditions, the reduction of forest area but also intensive grazing and unsuitable agriculture on steep lands can lead in time to serious ecological unbalance as a result of land degradation and intensification of torrential processes.

* C C.Giurascu, 1976 “Forests that have lived for thousands of years in Vrancea Mountains and that gave the name to this setting of the country, have disappeared due to a wild exploitation in less than four decades. The words said by the old man Ion Tatu din Popesti in spring 1974, at the age of 100 years are true and painful: “When I was a lad, the forest came up to the gate. Today, you have to walk for a day to find its paths”

At present, especially the land management system has a deciding impact on the evolution of torrential and land degradation processes in the area considered, the most intense processes occur in the watersheds with a low forest cover (below 30%) in the sub-Carpathians (including Vrancea depression and depressions between hills).

TECHNOLOGIES FOR SET UP OF FOREST VEGETATION ON DEGRADED LANDS IN VRANCEA AREA.

Researches conducted over a long period of time by the Forest Research and Management Institute and Focşani Station have resulted in establishing the culture type and specific operations for setting up forest vegetation on degraded lands.

Before presenting the results it is necessary to mention that due to torrential erosion and gully formation which were highly violent until starting the torrent correction works, along the largest area of Putna river watershed and its offshoots has called for large torrent correction works. In order to consolidate the torrential water network, in most cases it was necessary to perform rapids and dams of concrete or stonework with cement. In case of small gullies the rapids made of stone without concrete and the vegetal rapids made of buckthorn twigs, earth and stone were very successful.

Ensuring the slope stability by improving the hydrographic network by hydrotechnical works had a special role in the success of the forestation, degraded land improvement and protection of road network.

Set up of forest vegetation on degraded lands needs most of the time assistance works for consolidation, retaining water on slopes by terracing and molding of sliding lands and elimination of water in excess, where its needed. The works tat proved to be most successful are the following (Traci, 1985; Traci, Untaru ,1986; E. Untaru s.a., 1986, 1993, 1997).

- Land consolidation with fences and benches (Tg), on steep lands, with rocks on the ground, bare or almost lacking vegetation and with very active erosion (very strong to excessively eroded lands, gully batter, artificial batters, etc.). The terraces supported by fences or brick benches proved to be useful especially for pine species, characterized by low growths in the first 3-5 years and with a high sensitivity for root uncovering due to erosion. But it is not indicated to use these works in areas with land sliding or with tendency towards such phenomena.

-The dry brickwork benches (Tb) lead to very good results under the same conditions as the fences but only where stone could be found at the site; in this way, the land was cleaned of rolling stones. Terraces supported by benches can be made at longer distances than 3 m, according to the amount of existing stones. In such situations, between the bench rows, fences can be erected as completion (if the soil allows pole striking), vegetal reinforced terraces or vegetal corridors

-Vegetally reinforced terraces (Ta) behaved well on all lands with ground sliding, where sallow thorn bushes were close and where stems with twigs could be harvested.

These works successfully replace the fences and benches, with a high technical efficiency and a considerably lower cost.

- Unsupported terraces (Tn) had good results on stable lands, except the compacted or fallow ones. It is not indicated to make terraces on sliding lands or lands with a tendency for sliding.

-Vegetal corridors (Cd) are recommendable for strongly to excessively eroded lands and slopes, with inclinations over 30 degrees.

- Vegetable soil (Pv), brought when planted, used especially for lands with rocks, for poor sediments, shallow and skeletal soil and rocky areas, lead to increased maintenance and growth of tree cultures.

- Under extreme conditions of soil degradation and dryness or high content of skeleton, the best results have been generated by the use of seedlings with protected roots (grown into bags full with vegetable soil - Pp), especially for conifers (especially black pine and Scots pine).

Terraces supported by linear fences had good results on strongly to excessively eroded lands and gullied slopes, when the soil allowed the sticking of poles, that is when it was made up of soft stone or mainly of soft stone (loess, sand, marls, clays, gravel) and complexes of marls, clays and sandstone. At inclinations over 40(, the linear fences do not lead to satisfactory results, because they can be easily destroyed due to the high degree of land instability.

The use in the construction late in the autumn, winter and early in the spring of green willow twigs, root suckers and twigs of sallow thorn in the fence foundation lead to vegetating of the vegetative components, with positive effects on land consolidation and increase of fence sustainability, from 5-9 years (without vegetative components) to over 10 years.

The terraces supported by drystone works had excellent results on slopes with strongly to excessively eroded lands, with inclination of 15-35 (Their life is obviously much longer than the fences. They are economically recommendable only on lands with advanced erosion, where the stones can be found on the site.

The important species used for the forestation of degraded lands in Vrances were the black pine, Scots, pine, locust, Norway , sycamore, cherry tree, ash, flowering ash, mahaleb cherry, ailanthus, gray and black alders, European black poplar, European aspen, cotton poplars, sallow thorn, common hawthorn, red dogwood). On a smaller scale, other species have been used like: eastern red cedar, jack pine, western yellow pine, thuya, etc..

The plantations on terraces supported by fences and benches have had good and very good results, especially with the seedlings grown in polyethylene bags, with success rate for black and Scots pine over 95%. The success rate was in general over 85% when vegetable soil and bare seedling roots were used at planting.

The broadleaves have had in general a success rate between 70 and 90% according to the site conditions. The sallow thorn, in plantations with root suckers, from natural regeneration had a success rate between 70 and 85% on lands with stones at the surface.

In experimental areas, after the operations for land consolidation and forest vegetation tending operation, the restocking of blanks was between 20 to 30%. In the case when seedlings grown in polyethylene bags were used there was no need for restocking the blanks.

The observation on the evolution of the forest cultures established on vegetally reinforced terraces showed the following: in a first period of 4-5 years it has been noticed a strong growth of shoots and root suckers of sallow thorn which formed real vegetal corridors, at the foundation of the upper batter of the terraces, with an exceptional efficiency in stopping erosion and maintaining the terraces, while the pine seedlings planted on terraces had a moderate growths; a second period of 4-5 years when the growth of species planted on terraces is activated, together with a maintenance of the vegetative active state for the sallow thorn in vegetal corridors and a thirs period, after 8-10 years, when the development of the species planted on terraces is much higher than the one of the sallow thorn in corridors, which is slowly being dominated. Consequently, after 20 years from planting on excessively eroded lands, on marl-sandstone soils in Barsesti-Vrancea area, the Scots pine has reached 6.5 m in height and the black pine 5.9 m, with the crown density of the stand of 0.9. By comparing other specific methods to establish forest vegetation on terraces supported by fences, the total cost were reduced by about 60% and the period for close crop was reduced by at least 2 years.

Good result were obtained in the case of lands with advanced degradation also by their forestation with sallow thorn, followed by the replacement of the sallow thorn bushes after about 20 years when the degradation was stopped and the vegetation conditions were improved. The most efficient method for substituting was the opening of 6-10 m wide corridors by sallow thorn clearcut, alternating with 2-3 m wide strips of uncut sallow thorn and forestation on prepared land on terraces. The important species used with good results in the substitution works were the Scots pine, black pine, forest cherry tree, ash and maple.

Except the locust cultures, established mainly in Colacu, Vidra, Iresti and Găgesti areas, most of the forest cultures for protection with the main species the black pine and/or Scots pine resulted from the substitution of the sallow thorn which has now different ages from 20 to 50 years. The older cultures cover lands with the most favorable site conditions, while the younger ones occur in areas with more difficult site conditions, where the vegetation could not establish in a first stage or where the sallow thorn plantations were substituted in time. The rate of stands based on pines (Scots pine or black pine) is about 70%.

The types of forest cultures with a good evolution and high efficiency in stopping the erosion on strongly to excessively eroded slopes were the following (Untaru et al., 1986, 1993, 1997)

- cultures of black pine mixed with broadleaves (maple, ash, wild cherry tree, mahaleb cherry, red dogwood, etc.), on strongly eroded lands as well as black pine cultures in association with sallow thorn, on strongly to excessively eroded lands, from the forest steppe up to the oak sub-zone;
- Scots pine cultures with mixtures similar with the ones for the black pine, on the

same categories of eroded lands, but with lighter to medium light soils in sessile oak and oak sub-zones .

- locust cultures, on light to medium light soils, from the forest steppe up to sessile oak sub-zone.

The types of forest cultures had a positive evolution and a high efficiency in slow stabilizing of lands with stones were the follwowing:

- cultures with black pine and/or Scots pine in mixtures with broadleaves (ash, wild cherry tree, mahaleb cherry, red dogwood, etc.) on sliding lands or weak to moderately fragmented lands by with low mobility in the sessile oak and oak sub-zones;
- locust cultures, on sliding lands with light to medium light soils, from the forest steppe up to the sessile oak sub-zone;
- cultures with black and gray alder and willows, on lands with surplus of water, in the sessile oak and common oak sub-zones;
- cultures with sallow thorn, oleaster and false indigo, on strongly fragmented lands mostly with stones at the surface and on the rifts, rich in calcium carbonates.

The types of forest cultures had a positive evolution and a high efficiency in stabilizing lands with deep erosion (slopes of gullies and torrents) are the following:

- cultures with black pine and/or Scots pine, mixed with sallow thorn, on slopes with an inclination lower than 25 degrees in oak and sessile oak sub-zones;
- locust cultures on slopes developed on loess or gravel soil, poor in calcium carbonates, from the forest steppe up to the sessile oak sub-zone;
- cultures with sallow thorn, oleaster and false indigo, on soils rich in calcium carbonates;
- alder cultures, on wet or shaded slopes in the forest area.

Types of forest cultures with a high efficiency in stabilizing the torrential sediments and river bank protection are the following:

- cultures of local poplars and cotton poplars, on fertile and light sediments in the forest steppe up to the sessile oak and oak sub-zone;
- black alder cultures, on lands with soils storing accessible ground water from the forest steppe up to the sessile oak sub-zone;
- gray alder cultures, on deposits from the sessile oak sub-zone up to the spruce subzone.

IMPROVEMENT OF SITE CONDITIONS AND LANDSCAPE REHABILITATION AS AN IMPACT OF THE PROTECTIVE FOREST CULTURES

The researches conducted by ICAS Focsani on experimental areas for degraded land improvement (Untaru et al, 1994, 1997; Constandaache et al, 2002) shows the important role played by the forest vegetation in general and by the forest cultures established on these lands in particular, in protecting and improving the environment.

Due to their role for soil protection (anti-erosion), these cultures are real shields pro-

tecting against erosion and land sliding and due to their hydrological role, they lead to the control of discharges of ground water and run-offs in depth and to alleviation of torrential processes.

On the entire area with forestation works, the forest cultures established on degraded lands play an important role for hydrological and antierosion protection.

The works for land correction and forestation of degraded lands in the improvemen areas studied have lead to very good results regarding the stopping of the erosion processes, stabilizing of land sliding and improvement of vegetation conditions. Also, under the action of the forest vegetation, the microclimate is significantly improved.

The measures applied and the land correction works for torrential watersheds in Vranceas area have lead to a good general evolution, emphasized especially by the erosion cease and land stabilization. Meanwhile important progresses were made in balancing the water flow on slopes and on the water courses. These changes are significantly shown in the present structure of the vegetal cover in all improvement areas of the degraded lands where important operations were applied concerning the change in uses and forestation of degraded lands.

The forestation works performed on lands with advanced degradation have had the biggest and most sustainable contribution in the rehabilitation of the degraded lands, on one hand, and on the reduction of torrential discharges (solid, as sediments and liquid), on the other hand.

After 25 years from the forestation works, land degradation was stopped on 90-95% of the area.

The stopping or stabilization of the degradation processes represent a first stage in the ecological rehabilitation of lands affected by degradation.

The researches conducted in Barsesti area regarding the superficial discharges and soil erosion have shown that on very strongly and excessively eroded forested lands, after 10-20 years since the installation of the cultures, the discharges of ground waters were reduced by 4-10 times, as compared to lands with active erosion, almost lacking vegetation.

The medium muddiness of the discharged waters dropped down to 84 g/l in the case of very strong to excessively eroded, not forested lands, to 7-13 g/l, in the case of forested degraded lands, while in a mature beech stand, the medium turbidity was 2,6 g/l.

Accordingly, the average specific erosion was reduced from 57,5 t/ha.year (between 55 t/ha.year and 60 t/ha.year) on lands with active erosion, almost lacking forest vegetation, to 0,41 t/ha.year (between 0,15 t/ha.year and 0,75 t/ha.year), in forest cultures with pine as main species with ages between 12 to 20 years, with only 0,12 t/ha.year, in mature beech forest. After the age of 25 of the forest cultures with black and Scots pine as main species, the average specific erosion was reduced below 0,1 t/ha.year,

The strong reduction of the discharges of ground water and soil erosion due to the action of forest vegetation (from 50 t/ha.year, to less than 1 t/ha.year) has lead to the restoring of soil formation on lands with ground stones (especially due to the increase capacity for water retaining and stocking as the physiological volume increases, due o the change of the superficial run offs in run offs in depth and structure restoration).

Accumulation of organic matter on lands with stone (typical erodable soils) when the cultures are 20-30 years old, in the upper 3-5 cm, vary according to culture type, nature of lithological substratum, relief and climate conditions, between 1 and 4% and in the lower 10-15(20) cm, between 0.5-1.5%.

The strong alleviation of the superficial run off and soil erosion under the impact of the protective forest cultures has led to the restoration of the pedogenesis process, on lands with stones and improvement of lands with different erosions and forming soils. Therefore, after 15-20 years from establishing the protective forest cultures, on excessively eroded lands, with a 25-30 degrees inclination, in the upper 3-50 cm, it was noticed an accumulation of organic matter and initiation of soil crumb development. Under the pressure of roots of pine, locust, sallow thorn, alder, etc. it occurs the dislocation of partially disintegrated rock fragments and increase of edaphic volume, together with soil loosening. After the same period of time, it was noticed the development of a 1 cm deep litter level, in the cultures with Scots pine as main species and 1-2 cm deep in the ones with black pine.

Pedological analysis (E. Untaru et al, 1994), in the Arch sub-Carpathians (Andreiasu and Bârsesti improvement areas, in Vrancea Sub-Carpathians and Livada and Murgesti improvement areas in Buzau Sub-Carpathians) show that organic matter accumulations depends on the culture type nature of the lithological substratum and climate conditions.

In the forest steppe, on gullies slopes, on alternating sands, gravel and clays, after 45 years since the establishment of the forest vegetation (under the impact of two successive rotations of locust), the organic matter accumulation in the upper 5 cm was between 1.69-2.37% (in average about 2%), in the lower 10 cm, it varied between 0.69-0.73 % (in average about 0.7%) and in the next 15-30 cm, it was about 0.4%.

In the oak sub-zone, on excessively eroded slopes, on alternating clays, sands, gravel and lams, the organic matter accumulation in the upper 5 cm, after 20 years, was about 0.9% under the impact of Scots pine cultures and about 1.4% under the impact of the sallow thorn cultures. In the next lower 10 cm, organic matter accumulation was about 0.6% under the impact of pine cultures and about 1%, under the impact of the sallow thorn cultures. On gully slopes, organic matter accumulation in the upper 5 cm was 2.13% after 20 years since the establishment of the culture of black pine in mixtures with sallow thorn; 1.45% under the impact of pure sallow thorn cultures and 1.45%, under the impact of locust cultures. In the following 10 cm, the content of organic matter was 1.68% in cultures of black pine and sallow thorn; 0.84% in sallow thorn cultures and 0.54% in locust culture.

In the sessile oak sub-zone, on excessively eroded slopes, after 40 years since the establishment of the forest vegetation, initially represented by sallow thorn groups, substituted later by black pine, the content of organic matter varied between 2.80 and 3.38% in the upper 5 cm (in average about 3.10%) and between 0.93 and 2.22% in the following 10 cm (in average about 1.6%).

On excessively eroded slopes, in complexes of marls and sandstones, after 16 years since establishment of forest vegetation, represented by the black pine and Scots pine in mixtures with sallow thorn, the content of organic matter varied between 1.49 and

2.09% in the upper 5 cm (in average about 1.8%) and between 1.45 and 1.70% in the following 10 cm, in average 1.5% (Figure 2).

On gully slopes, in complexes of marls with sandstones, after 16 years since the establishment of the forest vegetation, represented by the black pine and Scots pine in mixtures with sallow thorn, the content of organic matter in the upper 5 cm was about 1.3%.

In the oak sub-zone, on excessively eroded slopes, in complexes of marls with sandstones, after 30 years since the establishment of the forest vegetation, represented by black pine and/or Scots pine cultures, in mixtures with sallow thorn, the content of organic matter was between 2.8 and 2.91% in the upper 5 cm (in average about 2.8%) and between 1.83 and 1.91 in the following 10 cm (in average 1.9%). Under similar conditions, under the impact of sallow thorn cultures, the content of organic matter in the upper 5 cm was about 3.1%.

On gully slopes, in complexes of marls and sandstone, with gray alder, after 30 years since the establishment of the tree cultures, the content of organic matter in the upper 5 cm was 3.4%.

The species in symbiosis with lower micro-organisms (bacteria or actinomycete) have a special contribution in soil improvement by accumulation of nitrogen easily assimilated by the plants. Among the woody species used for degraded land forestation and which improve the soil are: the locust and false indigo, in symbiosis with nitrogen bacteria; sallow thorn, gray and black alders and oleaster in symbiosis with the actinomycete

Consequently, the mixtures of black and Scots pines with sallow thorn lead in identical site conditions, to growth rates of 20-30% for the planted pines in mixtures with sallow thorn as compared with the pure pine cultures. The wild cherry tree was very sensitive to the soil improvement through the contribution of sallow thorn; it had active to very active growths, in substitutions of sallow thorn, on very strongly to excessively eroded lands. Similarly, the association of poplars with gray and black alders lead to the activation of poplar growth.

The positive impact of protective forest cultures on the improvement of vegetation conditions, and implicitly of the soil, associated with the climate improvement impact, by alleviating the temperature extremes and reduction of solar radiation, lead, especially on lands with moderately to strongly eroded soils, to the natural establishment, in the shade of the species from the first forestation, the oak, sessile oak, beech, wild cherry, ash, alder, mahaleb maple, ash-leave maple, Tartarian maple, black cherry, red dogwood, etc.

The knowledge on the progressive improvement of the vegetation conditions and especially of the soil has a significant importance in establishing the forestation composition, for the following stage of forest culture succession, in transition toward zonal forest types.

The result in Vrancea confirm that among all vegetal associations, the forest is providing the best protection against soil erosion. As a result of stopping the water discharge on the ground, the forest vegetation facilitates the inflowing of the water in the

soil, spring formation and a balanced flow of streams and rivers. In this respect our researches show that due to the afforestation of degraded lands, in some improvement areas, of which we mention Andreiasu improvement area, springs and stream that have dried decades ago have reappeared with a permanent and balanced flow. Consequently, together with the improvement of soil and climate, but especially as a result of control of water discharges on the ground, the run offs in depth have been controlled and the springs have been restored, on lands with forestation works. Forest vegetation established on degraded lands has also a significant role in reducing the flow variations and, implicitly, in providing permanent and balanced discharges, by increase of snowfalls and delay in its melting.

In almost all situations, by establishing the protective forest cultures, after the degradation processes have stopped, a general improvement of the site conditions and environment has been noticed.

In the case of weakly to moderately eroded lands, under the impact of forestation and soil consolidation works the water retention and stocking capacity in the soil increased, the water superficial discharges were reduced and soil structure was improved.

Building terraces for soil preparation for planting has also represented an efficient means to increase soil humidity and increased growths for forest species planted under these conditions, as compared to the lands without terraces.

In the case of strongly eroded lands, as result of the forestation and soil consolidation works (by terracing or planting holes), the water retention and stocking capacity has considerably increased, the superficial water discharges were reduced, the soil structure was improved, the soil loosening occurred and its volume was increased under the action of the forest species roots. Also, the content of organic matter (humus) accumulated in the soil has increased due to the decomposing of the organic remains on the ground.

Terracing works represented in this situation an efficient means to increase soil humidity (by 15-25%) resulting in the success of the forest cultures and growths about 25% higher, as compared to lands without terraces (E.Untaru, 1986).

In the case of very strongly to excessively eroded lands and with gullies, quite frequent in Vrancea area, the contribution of the forestation works and the ones for land correction, consolidation and maintenance of the established vegetation (on terraces supported by benches and fences, vegetally reinforced terraces, vegetal corridors, etc.), the improvement of the vegetation conditions and environment is highly significant.

Good results in the stabilizing of degraded lands and improvement of site conditions were obtained for lands affected by land sliding. These lands have suffered degradations of different types and intensities that have an impact on their ecological feature. The main categories of degraded lands resulted from land sliding: lands with rock on the ground, representing sliding areas with vegetation conditions similar to gully slopes and sliding lands variously fragmented (resulting after the mixture of the soils with the rock, which are the most frequent, with different microrelief and various fragmentation degree; land displacement, in case of deep sliding, when vegetation conditions change very little; lands with a temporary or periodic water in excess).

In general, due to land sliding fragmentation of the sliding earth occurred, resulting the so-called raw soils, made of inhomogeneous mixtures of mattes from different levels of the former zonal soil and rock. In micro-depressions, due to the inappropriate drainage of water during the rainfalls, there frequently occur water stagnation and swamping. In the cases when the basement rock (marls, clays) came predominantly up to the surface, the vegetation conditions worsened so much that only a low number of species can vegetate here.

Sliding lands have a strong lack of uniformity related to forest vegetation development. In general, they are complex land formations, which include a high diversity of site units, sometimes very different related to ecology and forest production. The researched have led to the conclusion that the mobility of certain categories of sliding lands caused by a strong gravity and hydrological unbalance has a crucial importance in the establishment of the forest vegetation and its development, sometimes being a restrictive factor (E.Untaru, etc., 1982).

The forestation works, drainage of water in excess and consolidation works have had a significant contribution in stabilizing the sliding lands and in the improvement of vegetation conditions.

Land displacement was considerably reduced with over 80%, after 15-25 years from the bedrock and slope consolidation, associated with forest tree and shrub plantations (when the forestation works were appropriately supported by consolidation and correction works, consisting in the elimination of the water in excess, land micro-shaping and providing of a rapid discharge of the inflow that overflows towards the sliding area, associated with works for the consolidation of the foot of unstable slopes). Forest vegetation contributed to the rehabilitation of such lands especially by the restoration of the hydrological regime on unstable lands through biological drainage and correction of water discharges on the ground and run-offs in depth and vegetal reinforcement of soil with roots of trees and shrubs used for forestation.

Due to the correction works in the watersheds in Vrancea area, the geographic landscape had a remarkable positive evolution. The decisive factor in the positive changes was represented by the forestation of degraded lands, the main component of the complex works performed.

Before establishing the improvement areas for degraded lands, the dominating trait of the landscape was the gray almost bare lands, with very strong to excessive superficial erosion, with gullies or land displacement ((sliding, earth falls, mud discharges), sometimes with spots of grasses or clusters of forest trees or shrubs. The herbaceous vegetation, usually inconsistent and with a low species representation (especially Graminae) or the sporadic occurrence of trees and shrubs, whose growth was strongly influenced by the constant biting of the young shoots by the animals (by grazing), emphasized the desolation view of the landscape.

The step by step and progressive improvement of the site conditions, under the direct impact of the forest vegetation, lead, after a slower first development period of the cultures, to growth activation for most of the forest species used in degraded lands forestation, especially pine and mainly when they are 15-20 years old. Step by step, the gray

and desolation view of the degraded lands has been replaced by the cheering color palette of the established forest vegetation (characterized by a high variety of nuances from light-silver green of some broadleaf species like the sallow thorn and oleaster to the dark green of the black pine).

After the closing of the crop, together with the set up of the specific forest micro-climate, the forest cultures on degraded lands have started to fulfill esthetic-sanitary functions specific to the forest vegetation. Consequently, the area along roads like Vidra-Lepsa; Odobesti -Andreiasu; Valea Sarii- Nereju and Panciu- Soveja have become more and more appealing for tourism.

In the same time, forest vegetation on degraded lands have a benefic role in alleviating the climate adversities, contributing to the protection of localities and agricultural crops in the adjacent areas, by protection against frost of seeds in the ground, but especially by retaining a large amount of snow on the ground, useful to agricultural yield.

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