

## THE USE OF PROTECTIVE WINDBREAKS TO EXPLORE EFFICIENT THE LAND

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**Abstract.** Due to irrational management and exploitation of farmland and forests there were registered in the world, increasingly intensified soil degradation processes with negative effects on production costs and land use. The territory of the Moldova is characterized by rugged relief. Absolute average altitude of Moldova surface is 147 m, maximum - 429 m and minimum - 5 m. Predominance of the slopes on the 80% of the territory creates favorable conditions for the development of erosion processes. The area of eroded soils that have lost from 20 to 70% of their original fertility is about 36%.

**Keywords:** Republic of Moldova, arboretum structure, windbreaks,

### INTRODUCTION

Soil is a living environment support for humans, plants and animals, nutrients and energy storage, and water reserve. According to the Statistical Yearbook of Moldova on 1<sup>st</sup> January, 2012, the total area amounts the 3.38 million ha; including agricultural land - 2.50 million ha (73.8%), forest resources – 463.1 thousand ha (13.7%). From the total agricultural land of 2.50 million ha the arable land is 1.81 million ha (72.6%), orchards – 133.3 thousand ha (5.3%), vineyards – 149.6 thousand ha (6.0%), pastures – 350.4 thousand ha (14.0%). The data presented shows that the share of agricultural land is unacceptably high (73.8%), the forest resources - less than 5 times as the optimal one. A method used in preventing and combating soil degradation is afforestation, which can be whole or partial (Ciortuz, 2004): massive crops, protective windbreaks, hedges, alignments.

#### Classification of protective windbreaks

Protective windbreaks can be applied in all areas of vegetation. They can be classified according to several criteria, namely: (1) by the way they were formed (Fig. 1); (2) by the goal they serve; (3) by their permeability to wind; (4) by their arboretum structure; (5) by the nature of the species that composes them; (6) by the way they are oriented towards damaging winds.



Source: (a) <http://www.romanalibera.ro/actualitate/fapt-diversi/padurile-romaniei--de-la-defrisari-masive-la-solutii-pe-termen-lung-306247>; (b) <http://agroromania.manager.ro/articole/diverse/primele-perdele-forestiere-vor-fi-infiintate-anul-acesta-12001.html>

Fig. 1. Windbreaks by the way they were formed: (a) natural; (b) artificial

- (1) By the way they were formed the windbreakers can be:
  - natural, derived from a natural arboretum (Fig. 1-a);
  - artificial, man-made by sowing or plantation (Fig. 1-b).
- (2) By the goal they serve the windbreaks can be classified as follows (DIRJA et al., 2009):
  - forest protection curtains (Fig. 2-a);
  - crop protection curtains (Fig. 2-b);
  - pastures protection curtains (Fig. 2-c);
  - communication paths protection curtains (Fig. 2-d);
  - settlements protection curtains (Fig. 2-e);
  - curtains for preventing and combating erosion (Fig. 2-f);
  - curtains for embankment work defense (Fig. 2-g);
  - curtains for maintaining and increasing the flow of rivers, lakes, ponds and reservoirs (Fig. 2-h);
  - curtains for fixing works defense and afforestation of mobile sands (Fig. 2-i);
  - curtains for strategic or national defense (Fig. 2-j).
- (3) Another classification criterion for windbreaks is the permeation:
  - *Penetrable curtains* are those that wind easily penetrates and have under the crowning floor only bare stems, lacking shrubs (Fig. 3-a);
  - *Semipenetrabile curtains*, those who are less penetrable than the previous ones, allowing the wind of medium intensity to pass through, without having to change its speed significantly (Fig. 3-b);
  - *Non-penetrable curtains* are those that are formed from a consistent arboretum from top to bottom, through which the wind does not move at all or very little at the bottom. At a wind of 3-4 m/sec. in the leeward side there is almost complete silence. All the wind passes over the curtain. When leafy, seen on the longitudinal profile these curtains do not allow to see empty spaces forming a completely green wall (Fig. 3 C).
- (4) Windbreaks classification by arboretum structure (CONSTANTIN, 1965):
  - Pure curtains formed by a single species (Fig. 4-a);
  - Mixed curtains formed by several species of trees and shrubs. The latter can be made up of mixt or pure lines of species that differ from one line to another. In the first case we deal with blended curtains, and in the second case, with curtains or strips mixed with pure lines (Fig. 4 b).
- (5) Windbreaks classified in terms of the species that make up the curtains (Îndrumări tehnice în silvicultură București, 1949).
  - Forestry curtains consisting of at least 80% of forest species (timber producing) (Fig. 5 -a);
  - Forestry - technical curtains those containing at least 21% of species producing industrial materials (Fig. 5-b)
  - Fruit-timber curtains those containing at least 21% of forest trees and shrubs (Fig. 5-c).
- (6) Windbreaks in terms of action against major damaging winds:
  - main curtains those who oppose major damaging winds, being built perpendicular or nearly perpendicular to the direction of these winds (Fig. 6-a);
  - side curtains built perpendicular or nearly perpendicular to the previous and aimed to oppose other winds (Fig. 6-b).



(a) <http://www.timpuldevalcea.net/?p=7942>

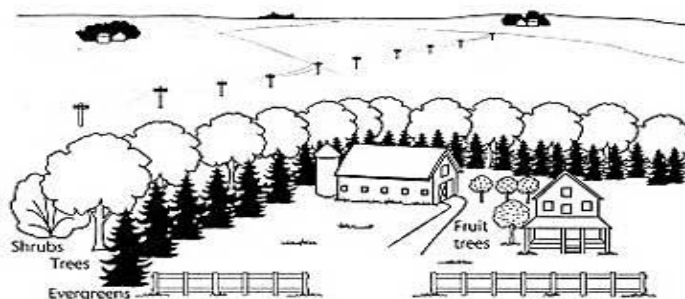


(b) <http://www.ecomagazin.ro/fermierii-incep-sa-planteze-paduri-pentru-a-si-protecta-culturile-agricole/>

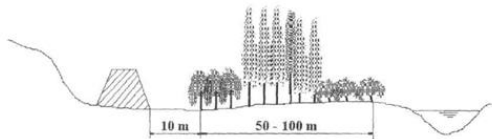


(c) <http://s1.ziareromania.ro/?mmid=7dfa81b1339c0d03df>

(d) <http://www.curierulnational.ro/Actualitate%20Companii/2014-02-05/Romsilva+vrea+19.000+de+hectare+de+perdele+forestiere+pentru+a+protecta+drumurile>



(e) [http://www.mothersgarden.net/content/0109\\_Windbreaks.html](http://www.mothersgarden.net/content/0109_Windbreaks.html)



(f) <http://www.revistapadurilor.ro/Arhiva/art78/foto3.jpeg>; (g) amelioratii silvice (Ciortuz , 2004 )



(h) <https://peterlengyel.wordpress.com/2013/11/03/cursuri-de-ape-din-maramures/>



(i) <http://www.energeia.ro/poluare/milioane-de-euro-pentru-impaduriri-1161/>



(j) [http://farm4.static.flickr.com/3344/3495478094\\_62e7548a96.jpg](http://farm4.static.flickr.com/3344/3495478094_62e7548a96.jpg)

Fig. 2 Windbreaks classified by the goal the serve



(a)



(b)



(c)

(a)<http://agroromania.manager.ro/articole/diverse/fonduri-europene-pentru-infiintarea-de-perdele-forestiere-cu-rol-de-protectie-11918.html>

(b)<http://maimultverde.ro/blog/2014/05/08/salcamul-in-romania-1/>

(c)<http://www.windbreaktrees.com/aust%20tree%20hog%20building%2009.jpg>

Fig. 3. Windbreaks by permeation or curtains density on longitudinal profile



(a)



(b)

(a) [http://www.periland.ro/wp-content/uploads/2015/01/periland\\_perdea\\_forestiera\\_salcam.jpg](http://www.periland.ro/wp-content/uploads/2015/01/periland_perdea_forestiera_salcam.jpg)

(b) <http://www.madison-swcd.org/images/Windbreaks.jpg>

Fig. 4. Windbreaks classified by the arboretum structure

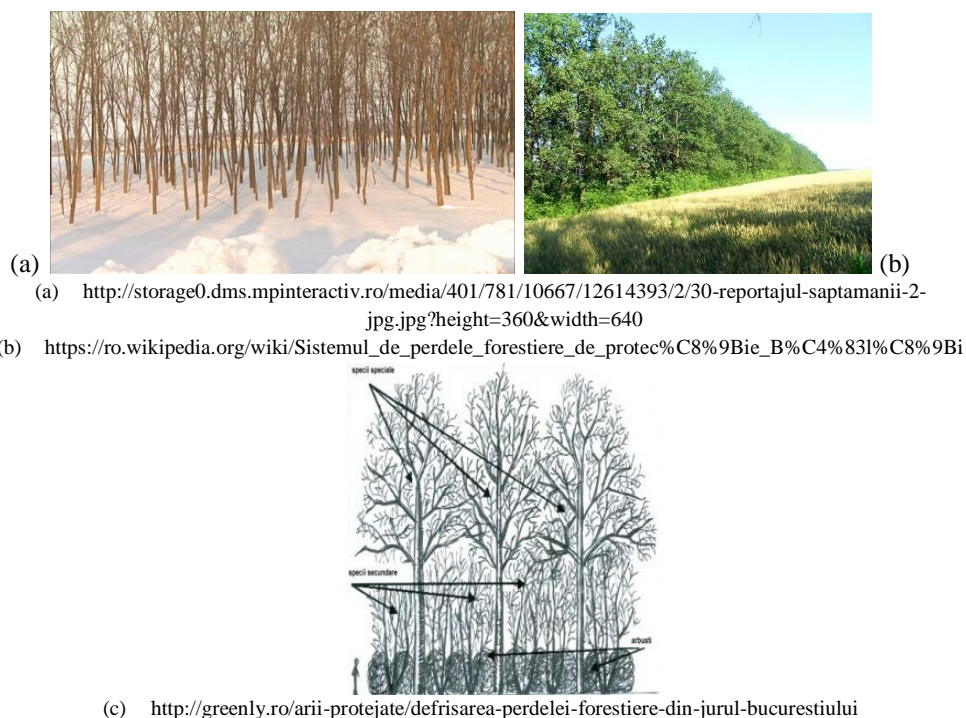


Fig. 5. Windbreaks by composing species



Fig. 6. Windbreaks in terms of action against major damaging winds

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