Project: ADER 11.1.2 / 28.10.2015

TECHNOLOGICAL SOLUTIONS AND SPECIFIC EQUIPMENTS FOR IMPROVING THE PERMANENT DEGRADED GRASSLANDS BY TOTAL RESEEDING

Acronym: ADER 11.1.2

Project Leader/Project director:
Research-Development Institute for Grasslands Brașov – ICDP Brașov / PhD. eng. Vasile MOCANU
Web Address : www.pajisti-grassland.ro
Consortium partners/ Project manager:

P1- Research-Development Station for Grasslands Vaslui–SCDP Vaslui / PhD eng. Doina SILISTRU;

Project Budget / cofinancing: 1.712.850 lei / -
ROMANIAN PASTURES

The grasslands in our country have an area of 4.9 million hectares, representing 33% of the agricultural area, being a part of the national patrimony, which is of major importance for animal feeding resources, as well as for the other functions with a beneficial effect on the protection and beauty of the environment.

The dispersal area of grasslands is found on all relief forms, exactly from the altitude of the Danube Delta and the plain, up to the altitude of 2500 m, from the alpine plateau of the Carpathian Mountains. This makes land resources for Romania's pastures extremely varied in all aspects: physical-geographic; climatic; hydrographic; the depth of the soil; soil types and physic-chemical properties.
LIMITATIVE FACTORS OF PRODUCTIVITY OF PERMANENT GRASSLANDS

Due to the fact that the grasslands are located in very varied stationary area conditions, usually occupying the surfaces unsuitable for other crops, either due to deficient soil physicochemical properties or because of soil orography or insufficient temperature, with too short vegetation from altitudes higher and other causes, their productivity is influenced both to the environmental conditions in which they are found and to the activities of man and his animals.

Areas of grassland affected by production limiting factors, in% of total area
GENERAL OBJECTIVE OF THE PROJECT:
Enhancement of the pastoral patrimony of Romania by increasing the quality and total feed production, with an optimal conversion into livestock products, in accordance with a good agricultural practice, characterized by harmonization of social and economic development, biodiversity conservation and environment protection.

Specific objective of the project associated with the ADER 2015-2018 Sectoral Plan:
Developing the technological solutions for the improvement, maintenance and use of pastures located in different physico-geographic regions (plain, hill, mountain) in the context of climate - soil - plant - animal – animal product - preserving biodiversity and environment protection.
Project specific objectives:

- breeding of perennial grasses and forage legumes: *Phalaris arundinacea*; *Phleum pratense*; *Bromus inermis*; *Onobrychis viciifolia*
- the approval of new varieties of studied perennial grasses and legumes, characterized by high ecological plasticity, adaptability, resistance to stress factors (diseases, pests, drought, frost, etc.), availability in various ways of use;
- production of seeds from the superior biological categories to the Romanian varieties of perennial fodder plantation, by the establishment of seed lots;
- storage of mixtures of grasses and perennial legumes according to the pedoclimatic conditions and different ways of use;
- developing zonal technologies to improve permanent degraded grasslands through total renovation (depending on the causes of degradation, pedoclimatic conditions, destination, etc.), to achieve sustainable agricultural systems with minimal effects caused by climate change, and economic optimization of sequences and technological links for obtaining and capitalizing on meadows;
- conceiving, executing and testing equipment specific to the mechanization of grassland improvement works by radical measures;
- promoting zonal technologies through different dissemination methods
RESULTS OF PROJECT - Extension; Utilization

-breeding and patenting of new varieties of studied perennial grasses and forage legumes;

-breeding the 3 varieties of perennial grasses, the species: *Phalaris arundinacea*, *Phleum pratense*, *Bromus inermis*
- the homologation and patenting of a perennial leguminous species, the species: Onobrychis viciifolia
-seed production of the higher biological categories (Breeder seed-SA, Pre-basic seed PB and Basic seed - Base) to perennial grasses and forage legumes for establishing the seed lots;
The quantities of seeds obtained during the period 2016-2018 at ICDP Brașov and SCDP Vaslui

<table>
<thead>
<tr>
<th>Nr. crt.</th>
<th>Species</th>
<th>Variety</th>
<th>Biological category</th>
<th>Annual quantity, kg</th>
<th>Total period, kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Festuca arundinacea</td>
<td>ADELA</td>
<td>SA</td>
<td>5.4, 3.7</td>
<td>9.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PB</td>
<td>5.0, 10.0, 2.7</td>
<td>17.7</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>B</td>
<td>4000, 2000, 1600</td>
<td>7600.0</td>
</tr>
<tr>
<td>3</td>
<td>BRIO</td>
<td></td>
<td>SA</td>
<td>1.6, 1.1</td>
<td>3.2</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>PB</td>
<td>6.5, 8.0</td>
<td>14.5</td>
</tr>
<tr>
<td>5</td>
<td>Festuca rubra</td>
<td>CRISTINA</td>
<td>SA</td>
<td>0.5, 2.5, 6.5</td>
<td>9.5</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>PB</td>
<td>8.5, 9.2</td>
<td>18.9</td>
</tr>
<tr>
<td>7</td>
<td>CĂPRIOARA</td>
<td></td>
<td>SA</td>
<td>- 12.0</td>
<td>3.3</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>PB</td>
<td>- 2.5, 0.5</td>
<td>3.0</td>
</tr>
<tr>
<td>9</td>
<td>PEISAI</td>
<td></td>
<td>SA</td>
<td>- 3.3, 1.5</td>
<td>4.8</td>
</tr>
<tr>
<td>10</td>
<td>TÂMPA</td>
<td></td>
<td>B</td>
<td>40000, -</td>
<td>4000.0</td>
</tr>
<tr>
<td>11</td>
<td>Festuca pratensis</td>
<td>TRANSILVAN 2</td>
<td>SA</td>
<td>- 3.3, 1.5</td>
<td>4.8</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td>B</td>
<td>4000, -</td>
<td>4000.0</td>
</tr>
<tr>
<td>13</td>
<td>Dactylis glomerata</td>
<td>MAGDA</td>
<td>SA</td>
<td>4.0, 1.0, 4.6</td>
<td>9.6</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td>PB</td>
<td>- 8.1, -</td>
<td>8.1</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td>SA</td>
<td>- 12.0, 1.9</td>
<td>13.9</td>
</tr>
<tr>
<td>16</td>
<td>INTENSIV</td>
<td></td>
<td>PB</td>
<td>6.5, -</td>
<td>6.5</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td>B</td>
<td>4500, 1000, 400</td>
<td>5900,0</td>
</tr>
<tr>
<td>18</td>
<td>Lolium perenne</td>
<td>MARA</td>
<td>SA</td>
<td>0.3, 0.5, 0.3</td>
<td>1.1</td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td>PB</td>
<td>1.8, 3.5, 2.1</td>
<td>7.4</td>
</tr>
<tr>
<td>20</td>
<td>MĂGURA</td>
<td></td>
<td>B</td>
<td>500, 1500, 820</td>
<td>2820.0</td>
</tr>
<tr>
<td>21</td>
<td>Phleum pratense</td>
<td>TIROM</td>
<td>SA</td>
<td>1.8, 2.0, -</td>
<td>3.8</td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
<td>B</td>
<td>2900, 1800, 300</td>
<td>5000.0</td>
</tr>
<tr>
<td>23</td>
<td>ALPINIA</td>
<td></td>
<td>SA</td>
<td>- - 0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>24</td>
<td>Phalaris arundinacea</td>
<td>PREMIER</td>
<td>SA</td>
<td>1.0, 1.2</td>
<td>2.7</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td>MINIER</td>
<td>- - 3.6</td>
<td>3.6</td>
</tr>
<tr>
<td>26</td>
<td>Lotus corniculatus</td>
<td>DORU</td>
<td>SA</td>
<td>5.0, 0.6, 0.3</td>
<td>5.9</td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
<td>PB</td>
<td>- - 0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>28</td>
<td>MĂGURELE 8</td>
<td></td>
<td>SA</td>
<td>4.5, 0.7, 0.3</td>
<td>5.5</td>
</tr>
<tr>
<td>29</td>
<td>Trifolium repens</td>
<td>MIORITA</td>
<td>SA</td>
<td>0.2, -</td>
<td>0.1</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td>CARPATIN</td>
<td>0.2, 0.2</td>
<td>0.4</td>
</tr>
<tr>
<td>31</td>
<td>Trifolium repens</td>
<td>DOINA</td>
<td>SA</td>
<td>8.0, 15.0, 5.0</td>
<td>28.0</td>
</tr>
<tr>
<td>32</td>
<td></td>
<td></td>
<td>PB</td>
<td>- - 24</td>
<td>38</td>
</tr>
<tr>
<td>33</td>
<td>Bromus inermis</td>
<td>MIHAELA</td>
<td>SA</td>
<td>9.0, 20.0, 12.0</td>
<td>41.0</td>
</tr>
<tr>
<td>34</td>
<td></td>
<td></td>
<td>PB</td>
<td>155, 14, 10</td>
<td>179</td>
</tr>
<tr>
<td>35</td>
<td>IULIA SAFIR</td>
<td></td>
<td>SA</td>
<td>13.5, 16.0, 6.0</td>
<td>35.5</td>
</tr>
<tr>
<td>36</td>
<td>MAIA SAFIR</td>
<td></td>
<td>SA</td>
<td>14.5, 22.0, 8.0</td>
<td>44.5</td>
</tr>
<tr>
<td>37</td>
<td>ANAMARIA</td>
<td></td>
<td>SA</td>
<td>5, 15, 23</td>
<td>23</td>
</tr>
<tr>
<td>38</td>
<td>Onobrychis viciifolia</td>
<td>SERSIL</td>
<td>SA</td>
<td>5, 12, 4</td>
<td>21</td>
</tr>
<tr>
<td>39</td>
<td></td>
<td></td>
<td>ANAMARIA</td>
<td>2350, -</td>
<td>2350</td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td>B</td>
<td>2350, -</td>
<td>2350</td>
</tr>
</tbody>
</table>
- designing, manufacturing and testing the equipment specific to the mechanization of grassland farming by total reseeding;

Experimental model of special seed drill for grassland forage plants MSPM-2.5 type

- designing

- manufacturing

- testing
-establishment of technological solutions for the improvement of grasslands by total reseeding methods

The technological solutions and technical means for improvement of the permanent pastures by total renovation method presented in this paper respond to the general objective of the field of GRASSLAND CULTIVATION promoted by the Ministry of Agriculture and Rural Development in the Sectoral Plan: **Enhancement of the pastoral patrimony of Romania by increasing the quality and total feed production, with an optimal conversion into livestock products, in accordance with a good agricultural practice, characterized by harmonization of social and economic development, biodiversity conservation and environment protection.**

Improvement of grasslands by reseeding method consists of the following groups of works:
- works to create optimal conditions for seed germination and development of a dense sward;
- sowing itself;
- post- sowing management.
The technological sequences for the total renovation performed in the experimental field Vlădeni, Țara Bârsei-Brașov

- seed bed preparing by repeated passes with disc harrow (2 perpendicular and the last in the direction of sowing, a);
- sowing with MSPFP-2.5 seed drill, ICDP Brasov type, which performs successively three operations (rolled, sowing, rolled), by one single passing (b);
- fertilization with liquid organic fertilizer (gulle type), 30-32 m³/ha (c);
- liming of 5 t/ha of hydrated lime with a free CaO content, of 87.34%, (d);
- yearly fertilization, on spring, with chemical fertilizers complex NPK 50; 50; 50 kg/ha (e).
The technological sequences for the total renovation performed in the experimental field, Drăguș Village, Făgăraș Lowland-Brașov county -Location I-The Animal Breeders Association HIGIURILE

- spring ploughing (a);
- seed bed preparing with rotary harrow (b);
- sowing with the seed drill, MSPFP-2.5, ICDP Brasov type, which performs successively three operations (rolled, sowing, rolled), by one single passing (c);
- liming with 4.5 t/ha of CaCO3 amendment (d);
- fertilization in the year of establishment with chemical fertilizer (e).
- yearly fertilization, on spring, with chemical fertilizers complex NPK 50; 50; 50 kg/ha (f).
Location II - Mixed Farm SC Gusutri Com SRL, Drăguș Village, Brașov-county

- autumn ploughing(a) – harrowing with disc harrow (b); - liming of 4.5 t / ha amendment of CaCO3 amendment (c); - prepare the germinative bed with disc harrow, 2 passes (d); - rolling before sowing (e);
- sowing with the universal grain seeder(f); - rolling after sowing (g);
- Yearly fertilization, on spring, with chemical fertilizers complex NPK 50; 50; 50 kg / ha (h).
The technological sequences for the total renovation performed in the experimental-demonstrative field Valea Tisăului area-Buzău county

- ploughing (a);
- Seed bed preparing with power tiller (b);
- manually sown or with self-propelled small seed drills (c);
- harrowing with domestic harrow operated by working animals (d);
- hand-rolling or by self-propelled domestic equipment, after sowing or after fertilization (e);
- annualy fertilization, on spring, with NPK complex chemical fertilizers 50; 50; 50 kg / ha (f).
- presentation and demonstration of technologies for permanent and temporary grassland cultivation;

Annual Session of Romanian Society for Grasslands, 7-10 July 2016

Pastoral Montan Patrimony Day, June 2018

Participation to The 27th European Grassland Federation General Meeting (EGF 2018, Cork, Ireland) with paper: 
Temporary grassland-an optimal alternative in crop rotation systems

Participation to International Simposium ISB-INMA TEH 2018, with paper:
A new machine for grassland reseeding, MSPM-2,5 type
- establishment of demonstrative lots with improved grassland by total reseeding methods;

Demonstrative plot, Magurele I, the first cycle of 2018, 2ha

Demonstrative plot, Vlădeni I, 7ha

Demonstrative plot, SC Gusutri Com SRL, Drăguș Village, Făgăraș Lowland, 28 ha
Experimental-demonstrative field, Valea Tisăului area, Buzău county, farmhouse

Animal Breeder Association HIGIURILE, Drăguș Village, 27 ha
- technical assistance to farmers in the field of fodder production;

- publication and distribution to farmers of leaflets and books with the results of the project (seed production, technological solutions, specific grassland farming machines, seed mixtures etc.).
CONCLUSION

Due to the diversity of the stationary area conditions in which the pastures that are suitable for improving by total reseeding methods, several cases can be found, influencing the application of different technological solutions.

To improve the degraded pastures by total renovation, within the project some technological solutions have been developed and some equipments for mechanization of grassland farming have been designed, made and tried, considering the causes of the degradation, the diversity of the stationary area conditions in which these surfaces are located and their destination (economic, protection, landscape beauty etc.). The Breeder Seeds (SA category) and the documentation for the registration and testing in the ISTIS network have been prepared, in the sense of homologation of a variety of *Bromus inermis*, *Phalaris arundinacea* and *Phleum pratense*, and the one for obtaining the patent for the *Onobrychis viciifolia* variety - SERSIL (provisional name: Vaslui 2), homologated in 2017, which was submitted this year to ISTIS.

In order to achieve the expected results within the project, activities were carried out in which were targeted:
- identification of areas with permanent degraded pastures to be improved by total renovation;
- analyze the causes of degradation, of pedoclimatic conditions and decision of technological solutions with a high degree of zonal extrapolation;
- the promotion of technical machinery for mecanization of grassland farming;
- establishment of seed lots of higher biological categories;
- the composition of seed mixtures of grasses and perennial forage legumes,
  depending on the zoning pedo-climatic conditions and different modes of utilization;
- verification of zonal technologies for improvement of degraded pastures by total renovation;
- the breeding of perennial grasses and forage legumes varieties adapted to the new conditions caused of the predicted climate changes;
- promoting zonal technologies through different dissemination methods.
In conclusion, the establishment of productive grasslands by total renovation depends largely on providing optimal conditions for seed germination, growth of plants and their root system, with the ultimate goal of realizing a dense vegetal sward.

For a successful action, it is necessary to deduce the reasons for the degradation of the pastures. To understand these reasons, several analyzes of the stationary area conditions, soil characteristics, botanical composition of the old vegetation, climatic conditions should be made. Moreover, on the basis of the analyzes and the results of the research in the field, the best solution for the improvement of the degraded grassland will be decided in accordance with the following factors: adequate soil treatment system for destruction the old vegetation, the optimum period of seed bed preparation and sowing, basic fertilization, composition of seed mixture, agricultural machinery and equipment for sowing and post-sowing management.

It will also be targeted that the proposed technological solutions eliminate or limit the effect of external restrictive factors, so as to ensure a high feed production and a high fodder value.
These are really tasty!

Thank for your attention!