Third International Conference on Geotextiles, 1986, Vienna, Austria

HAVARD, H., Laboratoire Régional Equipement, Les Ponts de Cé, France

GEOTEXTILE SEEDING FOR EROSION CONTROL
BEWACHSENE GEOTEXTILIEN IN DER EROSIONSSICHERUNG
ENGAZONNEMENT DE GEOTEXTILE POUR LA LUTTE CONTRE L'EROSION

A special geotextile was tested by seeding in laboratory and in the field. Results are interesting for erosion control.

1 - TESTED FABRIC

The tested geotextile is made of clothing manufacture waste, teased out and needle-punched on a polypropylene grid. It is sold as a stuffing material (mattress, quilting ...) with mark Hydronapp'matic by Ets BAUGAS - 49 CHEMILLE (FRANCE). Its physical characteristics are :

Characteristics are :	Average	CV %
Mass per unit area (norm NF G 38013)	548,9 g/m2	11,5
Thickness (norm NF G 38012)	4,1 mm	6,5
Tensile strength (norm NF G 38014) longitudinal roll direction	10 kN/m	2
With elongation at reference failure E_R	13,1 %	5
Transversal roll direction with elongation at référence failure E_R	10,3 %	8,1
Tear strength (norm NF G 38015) longitudinal roll direction	0,28 kN	7,1
transversal roll direction	0,32 kN	3,3 .

Polypropylene grid used was very thin with a lattice near of 10 x 10 mm, the effect of wich was only to prevent of tearing in the laying down.

This geotextile is made of synthetic and cutton yarns in variable proportion according to nature of treated waste. Although, cutton percentage, near of 70 %, is interesting for this use.

2 - WATER-HOLDING CAPACITY

No suction test was made. But we have approached the water-holding capacity of the geotextile by a method drawing from Feodoroff (1). Some 31 cm diameter, waterlogged samples were laid upon a sieve above a receiver. Preventing of evaporation drainage, the whole system was wrapped in a plastics, sealed film. We have measured seepage losses of the geotextile with time in order to know amount of fast seepage and then no gravific water-holding capacity (or specific yield). Figure 1 shows the very high water-holding capacity of this geotextile. If this water-holding capacity is estimated about 600 (that is pessimist according to fig. 1), the available water amount after important enough raining and gravific seepage would be about :

$$\text{water mass} = \frac{\text{geotextile moisture}}{100} \times \text{dry geotextile mass}$$

i-e about 3,3 kg or 3,3 l of water per m^2.

While for a classic, civil engineering-used geotextile (no woven polyester with mass per unit area 270 g/m2) of similar price, this value falls to 1,3 l/m2.

This water-holding capacity seemed attractive to use this geotextile as an artificial support to seeding, the high percentage of cutton increasing this interest.

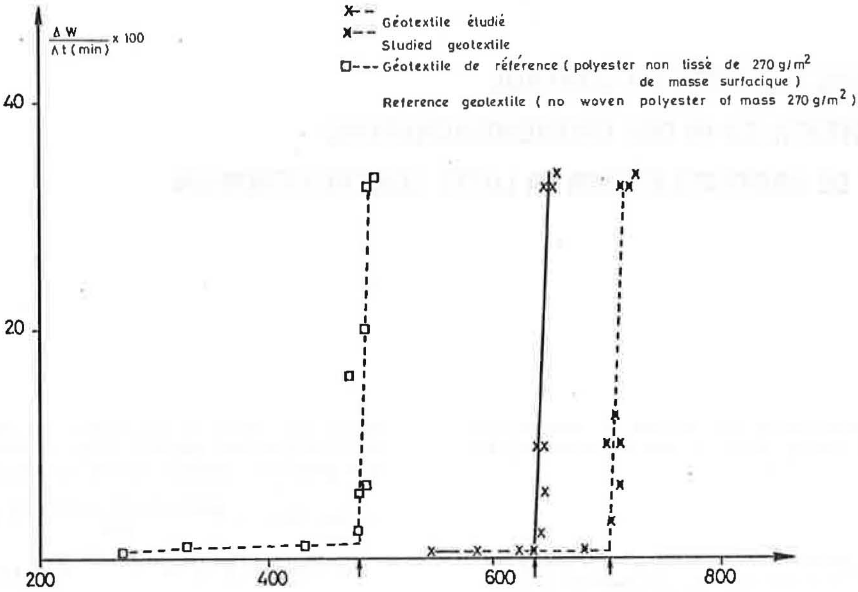

Fig. 1 - Estimate of water-holding capacity

3 - EXPERIMENTAL SEEDING IN LABORATORY

Seeding was realised with a commercial mixing of seeds :

50 % Lolium perenne Belida
25 % Poa pratensis Dasas
20 % Festuca rubra Rubrina
5 % Agrostis tenuis Highland

in a very high dose (about 100 g/m2) without any fertilisation.

We seed on the 6.1.84 on several samples of waterlogged geotextile and laid upon very clean Loire sand (coarse sand 0/4 mm with less than 5 % of grains smaller than 80 μ) almost barren. Dry Loire sand was spread in a 2-3 cm - thicked layer at the bottom of a 560 x 360 mm (L x B) rectangular, aluminium receiver (photo 1). Above the receiver, a plastics, light-opened, no sealed film was laid to prevent of evaporation drainage. The receiver was stocked in a laboratory-room at an almost constant temperature (18 à 20°C) and before a window.

In the same time, some different tests were tried (seeding under a layer or beetwen two layers of geotextile, under a polyethylene grid, on no-woven polyester geotextile ...). All the results so obtained were worst than the basis, upper-described test.

A seeding was realised too on a classic vegetal earth without geotextile after strongly watering and with a plastics film against evaporation drainage. The result was very poor because earth seemed asphyxiated in these conditions (organic matter without providing in oxygen ?).

Ten days after seeding, grass was raising largely on the normally seeded geotextiles (photo 2). This experience went on to 30.3.84 in the same conditions without any watering between seeding and this date. Photo 3 shows a satisfactory grass-quality on this date.

From 30.3.84, plastics film was withdrawed and geotextile exposed to a severe evaporation drainage in the warmed room. On the 13.4.84, experience was stopped. Grass had been dried but roots were largely (about 2-3 cm) introduced in the sand so imprisonned in the roots (photo 4). The dry geotextile was so weighting 2,7 kg for an area of 0,2 m2 with grass and especially the root-imprisonned sand. Roots were firstly growing across the geotextile, and then very fastly down to the sand. So the layer was tied to the sand about one month later the seeding was realised.

This experience proved the waterlogged, tested geotextile presented a water-holding capacity permitting seeds-sprouting and providing enough the grass during two monthes for keeping it green and abundant, with a very light evaporation drainage and a good temperature. So, an experiment was to start in the field.

4 - EXPERIMENTATION OF A SEEDED GEOTEXTILE ON SLOPE

After laboratory experimentation, we looked for fixing the seeds on geotextile (preventing of erosion). We found the best solution was seeding during the needle-punching of the layers. The seeds are so well-stabilised in the geotextile. Seeds mixing was the same as used for laboratory experiments. No fertilisation was brought. Layers of seeded, dry geotextile were fixed on on the slope with curved concrete irons (about 1 per a meter), and then lightly watered.

A first layer spreading about 4 m2 of area, was laid on a steep slope ($\beta \simeq 50°$) of clean sand 0/2 mm in LE MANS. Two tries of hydroseeding on this slope had been unsuccessful. This slope is looking to west direction. This seeding, realised on 13.9.84, began to raised and vegetated. We tried to seed again with fertilisation in April 85. Unsuccessfully. Photo 5 shows this test plot in April 85 (grass is very poor).

A second layer (about 10 m^2 of area) was laid in LE MANS too, on a identical sand. Slope (β = 30°) is looking to east direction. Grass raised fastly enough. Seeding was realised on 13.9.84. Photo 6 shows this test plot on 4.4.85. The grass being poor and too dry, we seeded again with fertilisation. Visiting again on 28.8.85, photo 7 shows a satisfactory covering grass (about 20 % area without grass) for such a slope. Photo 8 taken in the same time and place shows sliding vegetal earth spread on these slopes, while geotextile retained correctly the slope.

This geotextile is destroyed by light and raining. So, after one year ago, it becomes usefuless because damaged and then it is necessary the grass were settled.

5 - CONCLUSIONS

These experiments prove such a geotextile can be a good way to settle grass on barren or half-barren soils, preventing them immediately from erosion. It seems interesting especially for wet climates with heavy rains incompatible with seeding on a slope (erosion before sprouting of seeds).

Important limit for this proceeding : it is very sensible to evaporation drainage. That is the reason for reverse brought about an unfavourable exposure. The slope orientated towards East gave satisfactory results in LE MANS. Although, evaporation drainage is important there too. On a place of this plot, geotextile was laid in a double thickness ; and on this place, grass covering is clearly denser and greener than the remaining part. That proves available water amount in a layer at the water-holding capacity (about 3,3 l/m^2 being equivalent to 33 mm of water height) is not sufficient in the climate of LE MANS for a grass covering of quality. Fig. 2 shows important water lack incompletely covered by geotextile, double-thickness layer being insufficient too to avoid grass dryness.

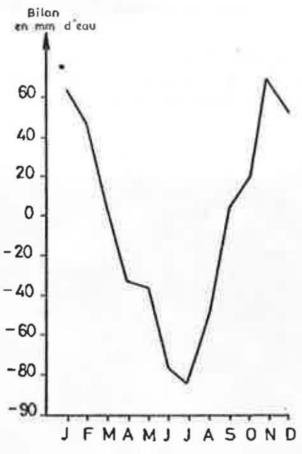

Fig. 2 - Water balance R-ETP average (Rain. Potential evapo-perspiration) in LE MANS betwen 1965 and 1978

However, Tab. 1 shows no negligible raining water amount even during water lack period, so limiting dryness the grass was submitted.

Monthes	Maximal rainfall per 24 h in mm	Rainfall duration in hours	Rainfall height	Number of raining days	Rainfall neight / Number of raining days
J	16,28	98	69	18	3,83
F	14,43	95	61	16	3.81
M	10,50	98	50	15	3,33
A	11,78	76	45	15	3,00
M	16,28	64	65	16	4,06
J	13,71	37	45	11	4,09
J	17,21	32	46	11	4,18
A.	17,86	35	57	11	5,18
S	18,50	44	65	12	5,42
O	11,78	52	47	13	3,62
N	20,92	95	76	18	4,22
D	10,00	82	56	15	3,73

Tab. 1 - Raining amount in LE MANS

Then use of such a fabric needs an estimate of water amount balance, raining water and climate for shady slopes and to look for an evaporation control method and for increasing temperature control too on the sun-exposed slopes. This control mays be obtained by an insulating, superfical material (thin sandy or earthy layer, straw - layer ...). Evaporation drainage control can not be assumed, of course, by a plastics light-opened film because the greenhouse effect.

This geotextile has to be considered as a stage for settling vegetation for it is destroyed after on or two years.

Bibliography. References.

(1) Feodoroff A. Beltremieux R. "Une méthode de laboratoire pour la détermination de la capacité au champ". 8 th Congress of Soil Science. BUCAREST. 1964.

Photo 1 : Seeding receivers stocking covered with a plastics film in a warmed room before a window. Experiment started on 6.1.84.

Photo 2 : On 16.1.84, grass is abready settled.

Photo 3 : On 30.3.84. No watering since on 6.1.84. Seeding is effective still, but grass is drying.

Photo 4 : On 13.4.84. A corner of seeded layer is folded up. Notice the important lot of sand trapped by the roots.

Photo 5 : On 4.4.85. Grass covering is poor and scarcely distinct on the photography. Geotextile is beginning to be destroyed at the top.

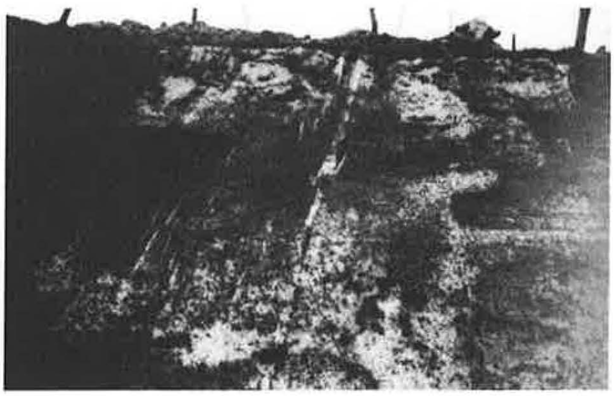

Photo 6 : On 4.4.85. Plot exposed towards East. Grass is poor. On each side, plot is surrounded by a vegetal earth layer.

Photo 7 : On 28.8.85. Vegetal covering is satisfactory on geotextile. About 20 % of area without any grass.

Photo 8 : Vegetal earth layer has a good vegetal covering, but is not tied to the slope and has slid.