



LEGAMBIENTE



Venerdì 10 maggio 2024
h 9.00 / 17.00

Arezzo, Sala Convegni/Borsa Merci
Piazza Risorgimento n. 23



**ALLUVIONI, ALLAGAMENTI E
FRANE QUANDO CAMBIA IL CLIMA**

Continua ad acuirsi anno dopo anno la crisi climatica, con conseguenze sempre più devastanti anche nella nostra regione, che nel 2023 si è classificata in 3^a posizione nazionale per numero di eventi estremi (44). Tra i più rilevanti, le alluvioni della Piana Metropolitana del 2 e 3 novembre, che hanno colpito in particolar modo le province di Firenze, Prato e Pistoia, provocando esondazioni di corsi d'acqua e allagamenti diffusi, danni calcolati per 2,7 miliardi di euro e ben 8 vittime.

Ad amplificare tali effetti contribuisce anche il consumo di suolo, sempre in aumento nonostante gli obiettivi europei di azzeramento al 2050. In un paese come l'Italia, dove il 93,9% dei comuni ha al suo interno un'area classificata a elevato rischio da frane e alluvioni, è indispensabile quindi, al contempo, lavorare per ridurre le emissioni di gas serra e gestire il territorio secondo un nuovo paradigma, attento anche all'alterazione dei cicli dell'acqua che si sta verificando a livello locale e che ha effetto sul clima. Legambiente in base al quadro suddetto ha deciso di dedicare il terzo Forum Acqua in Toscana a questi temi per evidenziare, insieme ai suoi interlocutori, le criticità e per avanzare delle proposte alla luce della recente approvazione del Piano Nazionale di Adattamento ai Cambiamenti Climatici.

CON IL PATROCINIO DI



CON LA COLLABORAZIONE DI



CAMERA DI COMMERCIO INDUSTRIA
ARTIGIANATO E AGRICOLTURA
DI AREZZO-SIENA



Arezzo, Borsa Merci
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LEGAMBIENTETOSCANA.IT

ARBOREAL SPECIES

SHRUB SPECIES

HERBACEOUS SPECIES

HERBACEOUS SPECIES PRATI ARMATI



quercia farnia

acero campestre

biancospino

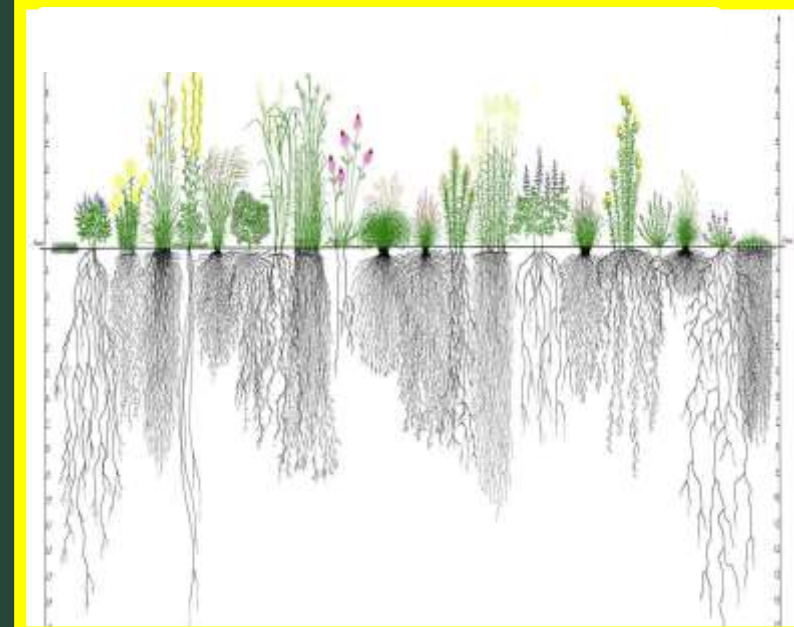


carpino

cileglio selvatico



Herbaceous plants generally called grasses are defined as those plants that do not have lignified stems. Salad is a herb



PRATI ARMATI® are deep-rooting, herbaceous perennials grasses.

Tree plants are what we commonly call trees. They are therefore plants characterised by a woody stem (trunk) that grows in height, reaching different sizes depending on the species.

Shrubby plants are what we generally call bushes and are small woody perennials with a stem branching out from the base.



radice di 3 metri



LAMPARADICE presente in Sala di Presidenza ANAS-ROMA

Sowing methods. Drilling on the contour in small drill furrows and pressing in with press wheels (Wilson, 1978) gives an excellent stand. Sowing sods at intervals of 0.6 m in rows 1.25 m apart is successful but laborious. In Sri Lanka, it has been found that close planting of [redacted] cuttings (with a spacing of 15 × 45 cm) increases yield. Transplanting of [redacted] seedlings is more reliable than that of root cuttings, especially if they have recently

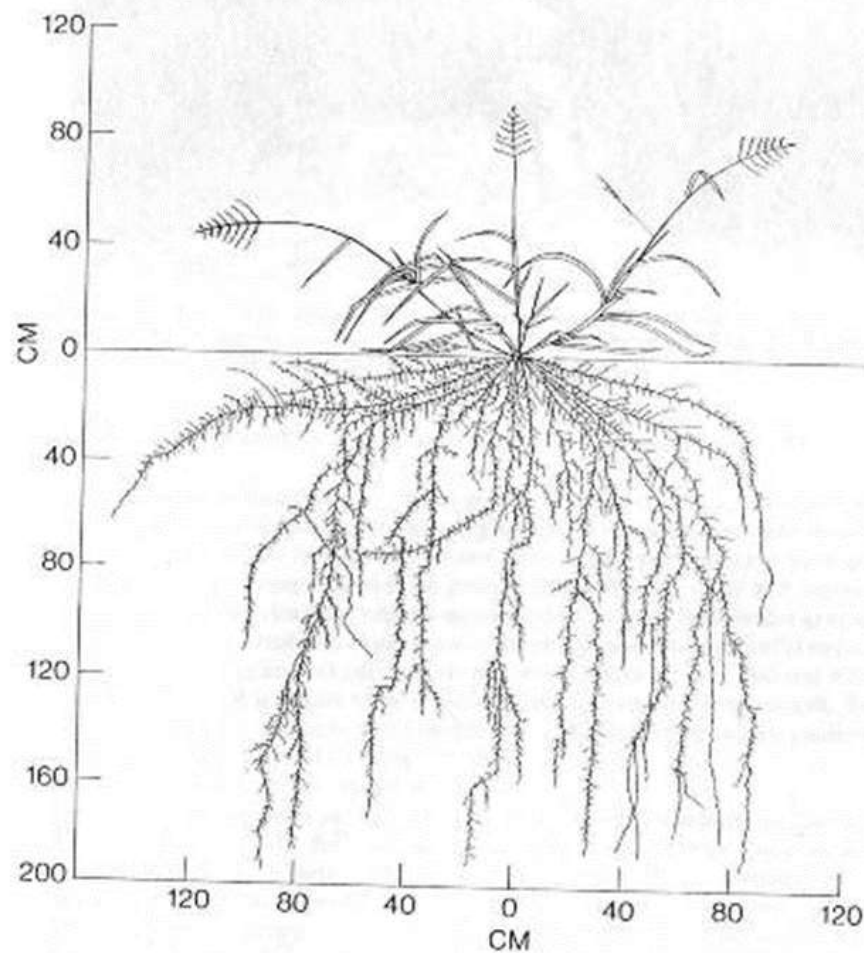


Figure 15.101. Vertical section showing the root system of [redacted] seven months after planting

started to show new growth after rain. In Puerto Rico it is also generally sown by clumps of roots (Vicente-Chandler *et al.*, 1953). One hectare will provide material for five hectares of planting.

Sowing depth and cover. Sowing depth should be no more than 1.5 cm. Ricket (1970) has shown better germination by using a straw mulch at 8 000–10 000 kg/ha to cover the surface-sown seed.

Sowing time and rate. Sow in spring or early summer, so the pasture is established before the extreme heat of summer, at 3–6 kg/ha (1–2 kg for 'Hamil', 3.5–4.5 for 'Common').

Number of seeds per kg. 1 750 000; 1 030 000 ('Hamil'); 2 200 000 (United States).

Dormancy. The quality of the seed improves for some months after harvest. **Seed treatment before planting.** It does not require any special treatment except ageing.

Seedling vigour. It has good seedling vigour.

Response to photoperiod. It is a short-day plant (Wang, 1961).

Response to light. It is fairly tolerant of shading, and in its natural habitat inhabits woodlands throughout subhumid Africa.

Compatibility with other grasses and legumes. Guinea combines well with the legume centro (*Centrosema pubescens*) and this is a common pasture mixture for the wet tropics. In Brazil, 'Coloniao' Guinea, centro and siratro are used successfully. Guinea and *Stylosanthes guianensis* is a successful mixture (see Plate 43, Fig. 15.102). Puerto (see Fig. 15.103) and glycine also combine well.

Ability to compete with weeds. In the wet tropics, weed competition is severe. However, a well-established Guinea grass pasture, well-fertilized, will suppress weeds.

Tolerance to herbicides. To control weeds in [redacted] atrazine (2-chloro-6-ethylamino-4-isopropylamino-1,3,5-triazine) can be used. Gatton panic survived over 4.5 kg AI/ha on the Atherton Tableland, Queensland whereas most of the associated weeds — *Nicaudra physaloides*, *Raphanus raphanistrum*, *Argemone ochroleuca*, *Ageratum conyzoides*, *Sida cordifolia* and *Eleusine indica* were killed with the low concentration of 0.9 kg AI/ha (Hawton, 1976). [redacted] is a major weed itself in sugar-cane fields, due to its ability to grow under poor conditions. It can be killed by a pre-emergent spray of 2,4-D sodium salt at 4.5 kg/ha of an 840 g AI/kg product (e.g. Hormicide). No wetting agent is required when used as a pre-emergent spray. Use a minimum of 340 litres of water per hectare. For seedlings in the five-leaf stage, use Diuron at 2.5 kg/ha of an 800 g AI/kg product (Karmex, Diuron) applied in a minimum of 340 litres of water per hectare. For mature plants use 2,2-DPA at 2.3 kg of a 740 g AI/kg product (Shirpon, Dowpon) plus paraquat at 85 ml of a 200 g AI/litre product (e.g. Gramoxone) plus wetting agent at 250 ml per 200 litres of water. Spray to the point of runoff (Tilley, 1977).

Response to defoliation. Guinea grass stands a good deal of defoliation but

La NATURA che SALVA SE STESSA

RAI UNO – LINEA VERDE:

<https://youtu.be/bbQNrK1IMTA>

<https://www.pratiarmati.it/articoli-scientifici/i-prati-armati-hanno-resistito-a-2-200-litri-m2-in-24-ore-nessuna-erosione/>

I PRATI ARMATI® HANNO RESISTITO A 2.200 LITRI/m²/IN 24 ORE: NESSUNA EROSIONE

Con l'Università di Perugia (professori F. Cotana, V. Pane e M. Cecconi) e l'Università della Tuscia (professori S. Grimaldi, C. Apollonio, A. Petroselli e F. Tauro), da luglio 2020 si sta verificando in campo la capacità dei PRATI ARMATI® di bloccare l'erosione e l'efficacia idraulica e geotecnica, anche sotto piogge torrenziali.

Il 10-11 ottobre u.s. sono stati scaricati, solo sulla parte inerbita con PRATI ARMATI®,

2.200 litri/m²/in 24 ore

La pioggia che cade a Roma in 2 anni e mezzo !

EROSIONE ZERO.

L'esperimento è stato ripetuto 3 volte a distanza di una settimana per un totale di 6.600 litri/metro quadro: la parte non inerbita ha collassato spanciando anche lateralmente.

RAI 1 – LINEA VERDE

La NATURA che SALVA SE STESSA RAI UNO – LINEA VERDE:



Autostrada A1 Variante di Valico



June 2021

20.000 m² relized in one day

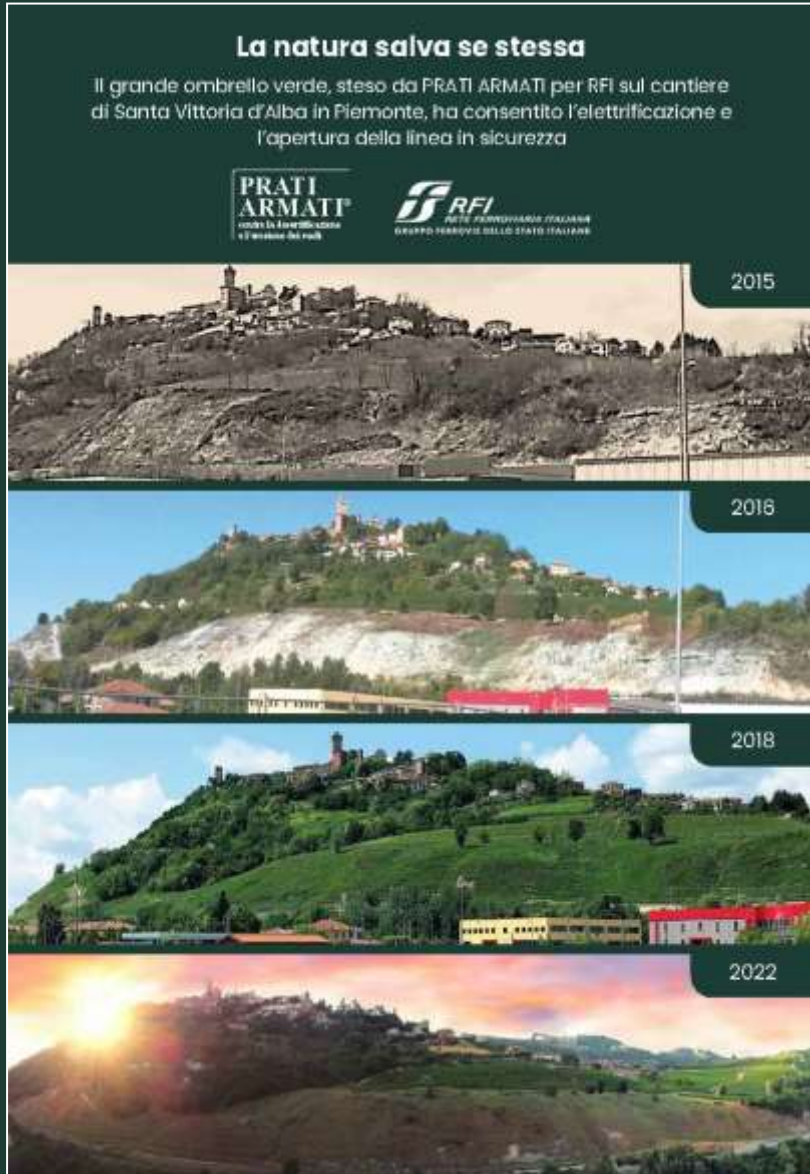


May 2022

Autostrada A1 Variante di Valico



Ferrovie, Strade e Autostrade protette dal dissesto idrogeologico grazie all'imponente ombrello verde PRATI ARMATI® come prescritto dall'Eurocodice 7, dal regolamento UE 2020/852 e dal principio DNSH



Collection and regulation systems for surface and meteoric waters directly applied on slopes, both soils and rocks and in any pedoclimatic condition.

Perennial Herbaceous Plants with Deep and Resistant Rooting System like PRATI ARMATI®, stop erosion and positively influence the stability of slopes thanks to hydraulic properties. This technology decreases infiltration, surface fissuring and interstitial pressure, improving the main geomechanical parameters of the soils. It also allows to realize directly on the soil as is, water collection and regulation systems, avoiding the use of artificial materials such as concrete and iron channels, bridges with stones, plastic material, biomats, geomats and so on.



The advantages of this solution in real-scale example Tecne-Autostrade per l'Italia, A1 (BO)

- The advantages of this solution are:
1. Perfectly adapt to the subsidence of the slope avoiding surface fissuring and infiltration,
 2. The deep and resistant roots anchor these herbaceous species in the underlying lithotype avoiding uprooting,
 3. The epigeal part slows down the water instant by instant,
 4. Avoid concentrated weights on the slope,
 5. It reduces crevasses and water infiltrations and does not give rise to the classic detachments of rigid structures, especially in steeply sloping areas.
 6. Do not require any maintenances
 7. It is a technology perfectly compatible with the surrounding environment and landscape.



Possibility of selecting, in a wide range, the most accurate Manning number

The use of species with mechanical characteristics such as stiffness, elasticity, resilience, etc. they allow the creation of surface water regulation works with very variable Manning coefficients, thus allowing the creation of different roughnesses with the consequent possibility of regulating, in a wide range, the speed and flow rate of the water flows

Ferrovie, Strade e Autostrade
protette dal dissesto idrogeologico
grazie all'imponente ombrello verde PRATI ARMATI®
come prescritto
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principio DNSH

Some R&D results

by Politecnico di Milano

POLITECNICO DI MILANO:

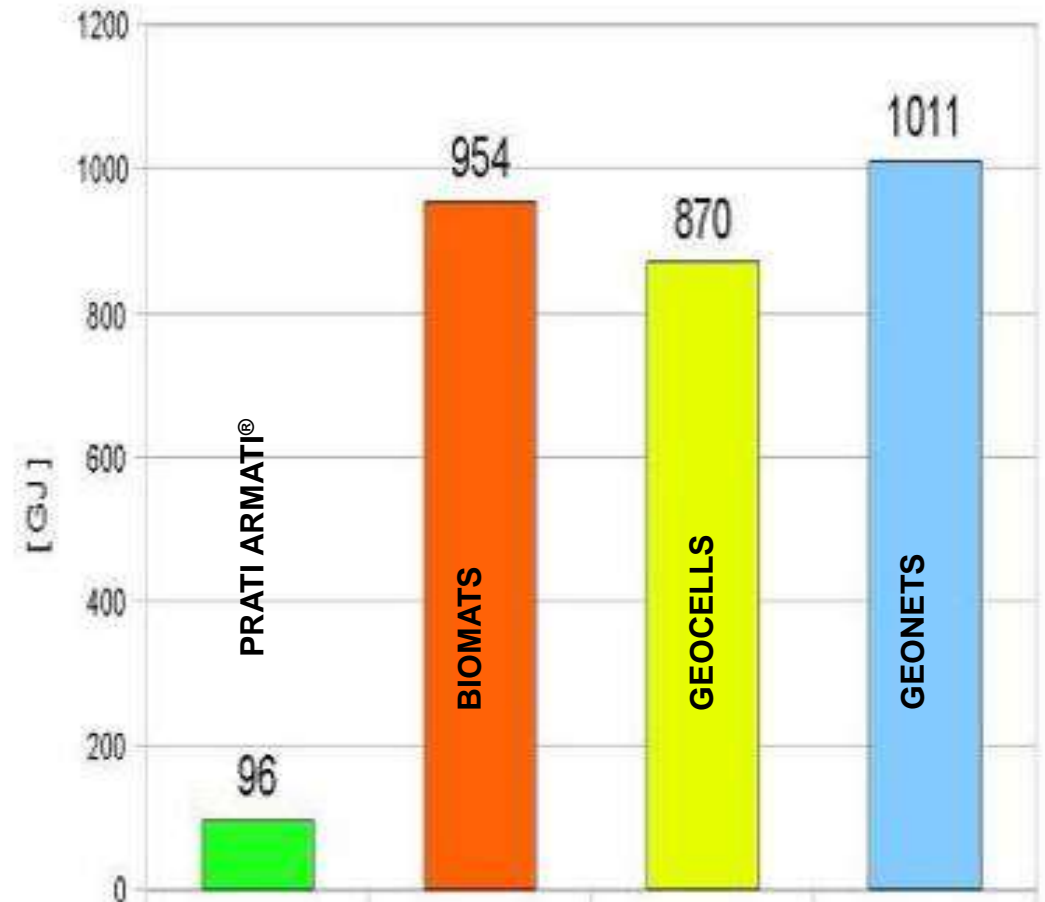
MOTORWAY SLOPE

energy requirements (expressed in GJ) and pollution emitted (CO₂, CO, NO_x, SO_x and particulate), for 1ha of slope, calculated according to four solutions:

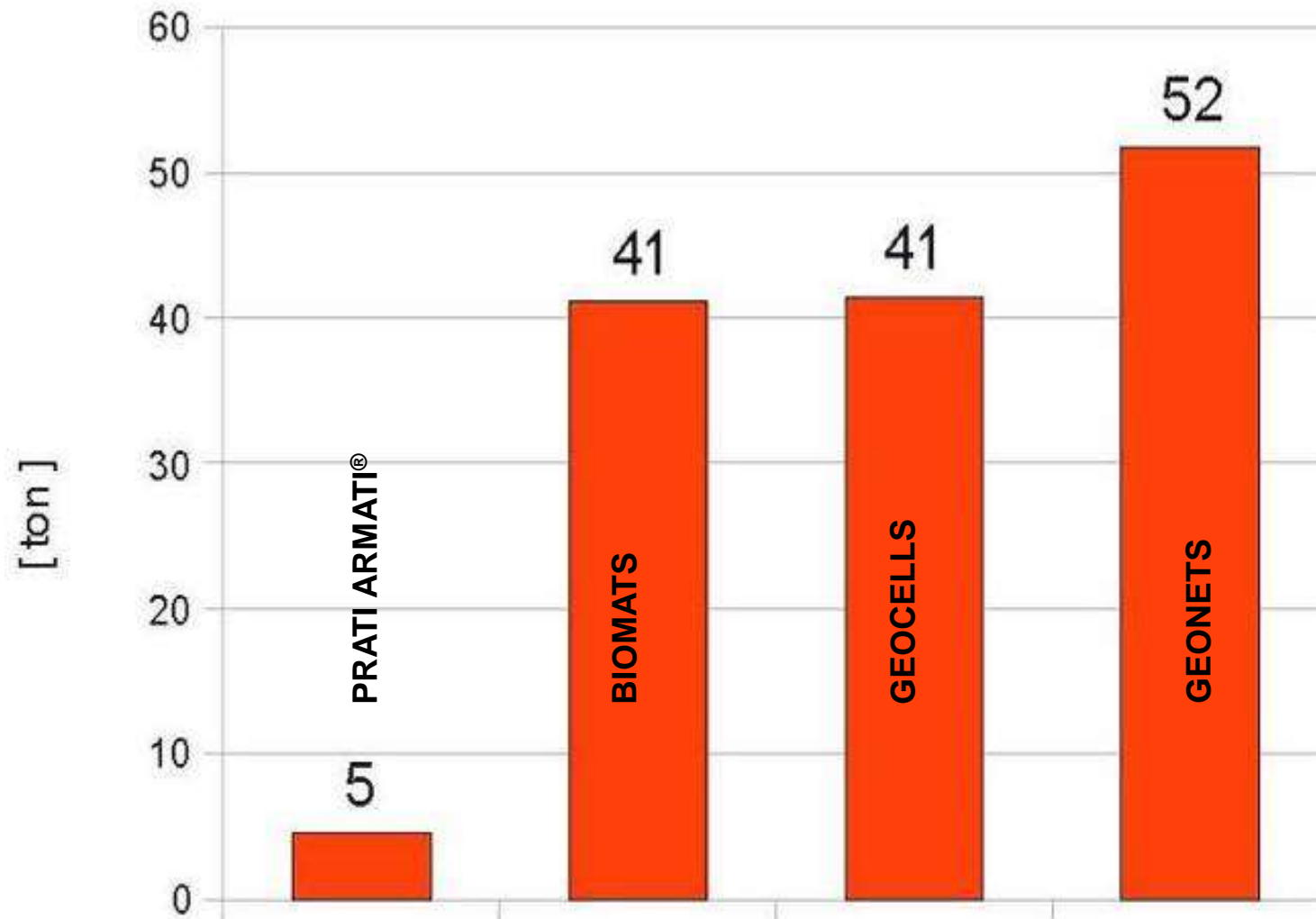
- solution with geonets;
- solution with geocells;
- solution with biomats;
- solution with deep rooting plants (PRATI ARMATI®)

1.000 GJ correspond to the energy contained in 24t of oil

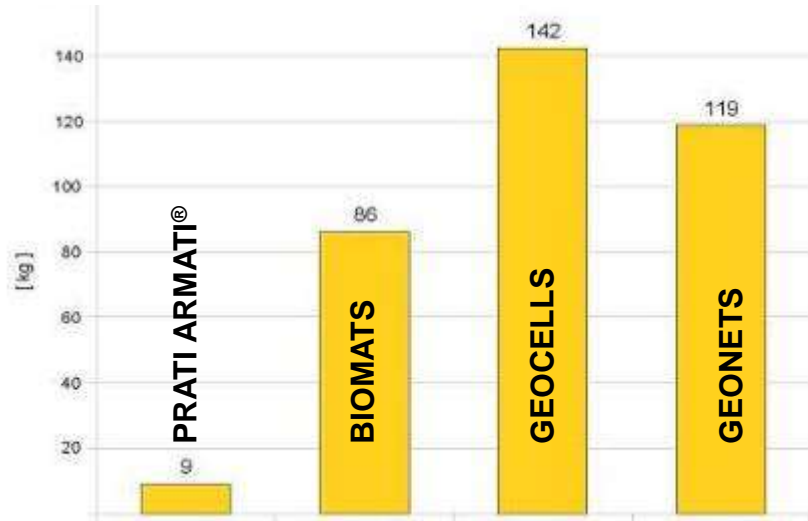
COMPARISON OF ENERGY REQUIREMENTS OF DIFFERENT SOLUTIONS



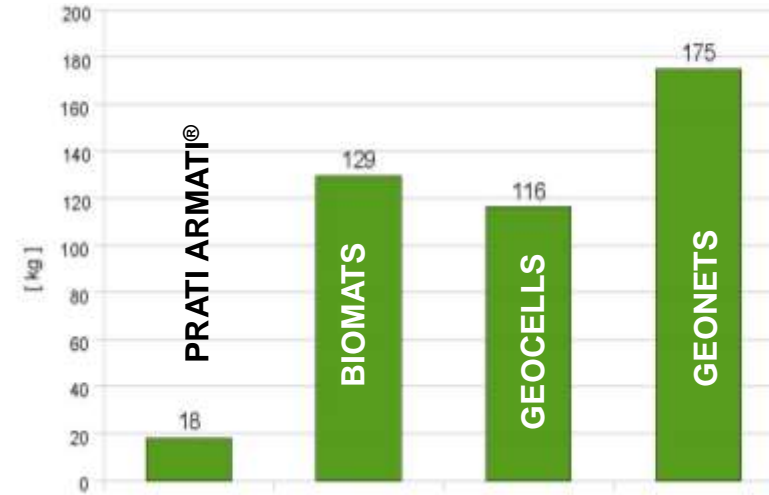
COMPARISON OF CO₂ EMISSIONS OF DIFFERENT SOLUTIONS



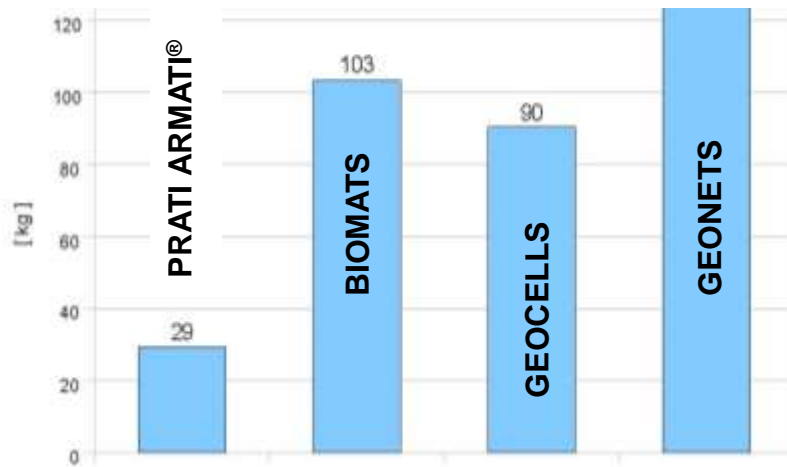
COMPARISON OF CO EMISSIONS



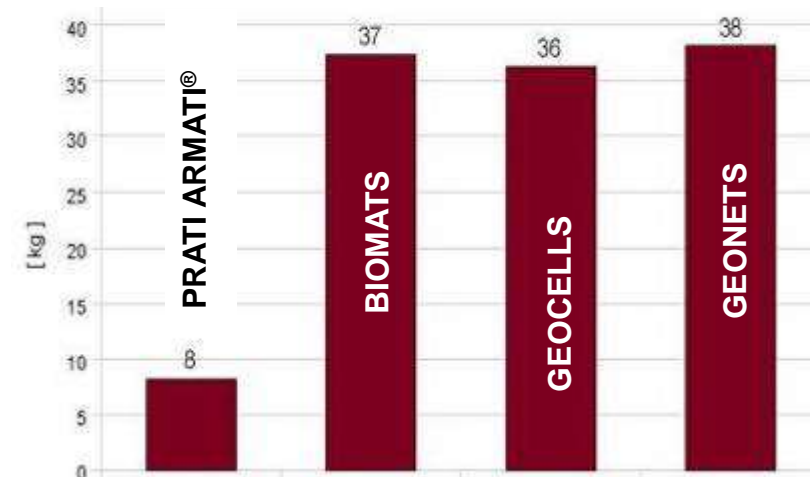
COMPARISON OF NOx EMISSIONS



COMPARISON OF SOx EMISSIONS



COMPARISON OF PARTICULATE EMISSIONS



PRATI ARMATI® AND KYOTO PROTOCOL

PRATI ARMATI® may store *up to* 400% more carbon dioxide (CO₂) than most common grassy plants used in traditional applications, thus contributing to the implementation of Kyoto Protocol

KIND OF GROUNDCOVER	TONS OF CO ₂ ABSORBED PER HECTARE EACH YEAR (t/ha/year)
Temperate deciduous forest (plants C3)	20
Temperate grassland (plants C3)	8
<i>Annual</i> corn plantation (plants C4):	41,5
<i>Perennial</i> PRATI ARMATI® anti-erosion groundcover (plants C4)	up to 40

CO₂ absorbing capability of different groundcovers
measured in tons per hectare per year

Thanks for your



attention

(a bouquet of flowers in a quarry)