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Office of the Royal Development  
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The Vetiver Network International  
Proven & Green Environmental Solutions

# The Seventh International Conference on Vetiver (ICV-7)

**THE USE OF VETIVER TO RAISE THE BANKS  
OF THE UFENTE RIVER: A NATURAL,  
EFFICIENT AND LOW COST SOLUTION**

**B.Castorina, Latium Vetiver**

# **ORGANIZATION OF THE PRESENTATION**

- 1. Description and significance of the Proposal formulated by Latium Vetiver to raise the banks of the Ufente River:**
  - How, in this specific case, Vetiver is the only practicable solution**
  - The use of Vetiver for this purpose as an example to be replicated**
  - Effective implementation of a Rapid Rooting System with the use of Ready-to-use Vetiver Hedges produced in the Latium Vetiver Nursery**

# **ORGANIZATION OF THE PRESENTATION**

**2. References made to previous work carried out by Latium Vetiver, as a catalyst for the development of:**

- The Ready-to-use Vetiver Hedge**
- The Vetiver Hedge Simulator (Vetiver filtering barrier simulator)**
- Integrated Environmental Architecture**

**3. Discussion of the the importance of overcoming resistance to solutions with Vetiver:**

- Resistance to the use of a plant in an emergency situation**
- Resistance to introducing a non-native plant on public land**

# **PROJECT BACKGROUND**

**The Ufente River is located within the Agro Pontino Reclamation:**

- An important engineering work consisting of a dense network of canals**
- which has made it possible to drain marshy and malarial lands**
- making them suitable for agriculture**
- creating economic and social benefits**
- located in the Lazio Region, Province of Latina, a city 70 km from Rome**



**Here is a map with the regions of Italy**

**In red the area where the intervention is planned**

## **The engineering choice made at the time of creating the Agro Pontino Reclamation:**

- to build the embankments using mainly local materials (silt and peat)**
- allowing subsidence movements to be contained over time**

**However, in a stretch of the Ufente River, embankments have been lowered by more than a meter creating a high risk of flooding in nearby lands, causing economic and social damage**



**August 1991**

**On the left, the collapse of the bank of the Ufente River**

**On the right, detail of the fracture**

**The problem of the lowering of the banks of the Ufente river due to subsidence movements has a long and troubled history:**

- Studies involving firms, universities and research centers have been carried out**
- No satisfactory results have been achieved**
- Complicated by the problem of creating sufficiently light structures to avoid increasing the instability of the banks**
- For this reason, systems involving concrete castings with light inert components, etc. were rejected**
- Additional requirement of containing costs to allow for intervention on the entire network of canals**



**In 2021, Latium Vetiver presented a Project that was accepted and included in the River Contracts in 2022 and is awaiting funding, including:**

- implementation of a Rapid Rooting System**
- with Ready-to-use Vetiver Hedges produced in the Latium Vetiver Nursery**
- to retain the soil from the moment it is put in place**
- to raise the embankments in the shortest time possible**
- activation of scholarships and research doctorates to create a symbiosis between work and research, and to promote and disseminate the use of Vetiver and Vetiver Grass Technology.**

# **MATERIALS AND METHODS**

## **The Project involves:**

- Raising the embankments by at least 90 centimeters with respect to their current condition**
- thus restoring them to their pristine state**
- in three distinct phases, each 6 months apart**
- completing the work in 18 months**
- Implementing a Rapid Rooting System of Ready-to-use Vetiver Hedges**

**The Project exploits the principle that the new Vetiver shoots always emerge at ground level, creating a continuum with the lower layers**

**The Ready-to-use Vetiver Hedge is produced in the Latium Vetiver Nursery, as follows:**

**The individual plants are placed in a plastic frame lined with a natural material filled with soil and Vetiver leaves.**

**After 3 months, the plants are removed from the frame along with the lining holding the soil, the leaves and the plants.**

**At this point, the roots of the plants have intertwined, forming a single element.**

**Since the roots have been restricted, when they are released from the frame, they rapidly expand stretching downward into the soil of the ground (the Rapid Rooting System).**



**Ready-to-use Hedge  
produced in the Latium Vetiver nursery**

## **In the first phase of the Project:**

- 7 Ready-to-use Vetiver Hedges are put into place**
- on a layer of peat, ground Vetiver leaves, expanded clay and vegetable soil treated with natural fertilizers**
- 30 cm high and 250 cm wide**

## **In the second phase after 6 months:**

- A new layer is added**
- 30 cm high and 200 cm wide**
- composed of the same materials**
- to which 5 Ready-to-use Vetiver Hedges are added**

**The roots of the hedges of the first layer will continue to stretch downwards while the new shoots will emerge 60 cm higher, as Vetiver always grows back to ground level.**

**The roots of the new hedges will cross the layer of soil previously laid, forming a continuum between the two layers.**

**In the third phase after 6 more months: new layer added in the same way as the second.**

**In just 18 months the embankments will be raised by 90 cm.**

**In addition to raising the banks,  
the Ready-to-use Vetiver Hedge simultaneously performs  
the functions of consolidation and total protection:  
the roots perform the function of the brackets in reinforced  
concrete beams, making the embankment a continuous  
beam which, resting on the more solid parts of the bottom,  
prevents the embankment from lowering where the bottom  
is weaker,  
while the leaves form a protective filtering barrier.**

**The Project also provides for collaboration with the University (including a study grant and a doctorate) as the intervention requires high-precision equipment to verify:**

- the condition of the area before the intervention**
- results at the end of each of the three phases**
- whether the objectives of the Project have been met**



# **DISCUSSION**

**Vetiver for environmental remediation was little known in Italy until the final years of the last century.**

**A great deal of awareness-raising work needed to be done by firms like Latium Vetiver, operating since that time.**

**There has been strong resistance by engineers to the use of Vetiver for slope consolidation, particularly in emergency situations.**

**This was the case of a Project for the town of Monterotondo, near Rome, in 2006:**

**An environmental engineering intervention collapsed, shifting downward and dragging with it part of the road below a settlement of public housing.**



**Monterotondo The environmental engineering intervention that caused the collapse of the road in front of public housing**

**Latium Vetiver was consulted along with a local engineering firm, which was against the use of Vetiver, maintaining that a technology based on plants was not safe to use in an emergency situation.**

**Latium Vetiver convinced the township and the engineering consultants, by inventing a mixed system, which it called Integrated Environmental Architecture, comprised of traditional engineering practices and the use of Vetiver Technology.**

**For a Project in 2012, Latium Vetiver utilized a new element, the Vetiver Hedge Simulator, within its system of Integrated Environmental Architecture, which I myself created as an Architect.**

**The Project was to consolidate a slope following a landslide on private property owned by an engineer in Morlupo, a town near Rome.**

**For the Vetiver Hedge Simulator (VHS), elements constructed off-site simulated the effects of the hedge grown on site from the moment they were put in place.**

**To construct the VHS, sheets of welded mesh are cut forming open squares and the long Vetiver leaves are woven into the open spaces to simulate the effects of the hedge as a filtering barrier. (For a detailed description of the construction of the VHS, see the paper submitted for this Conference.)**



## **Integrated Environmental Architecture**

**Vetiver Hedge Simulator with individual Vetiver plants behind it, on a slope after two months (Morlupo)**



## **Integrated Environmental Architecture**

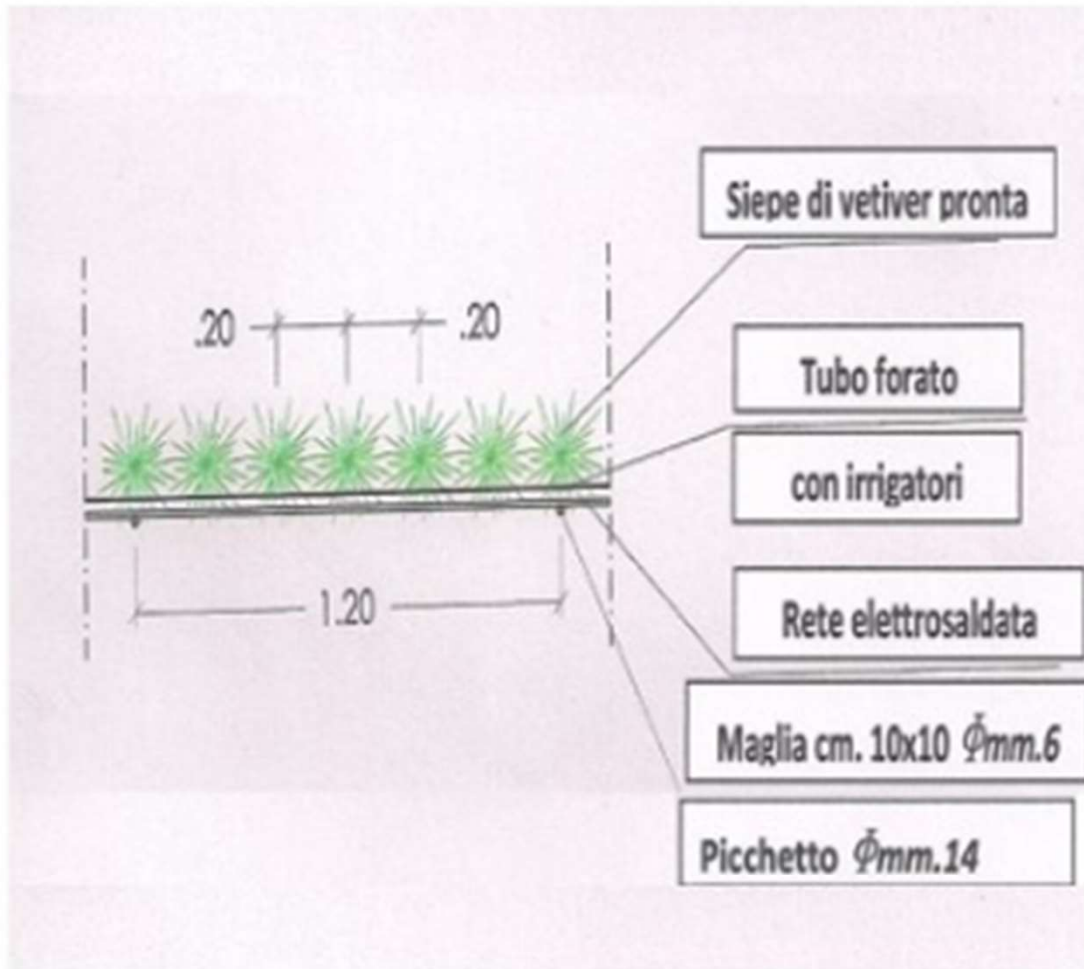
**Vetiver Hedge Simulator with individual Vetiver plants behind it, on a slope after six months (Morlupo)**

**Below are schematic drawings showing the Vetiver Hedge Simulator (VHS), which can be used by placing behind it the individual Vetiver plants at a distance of 20 cm apart,**

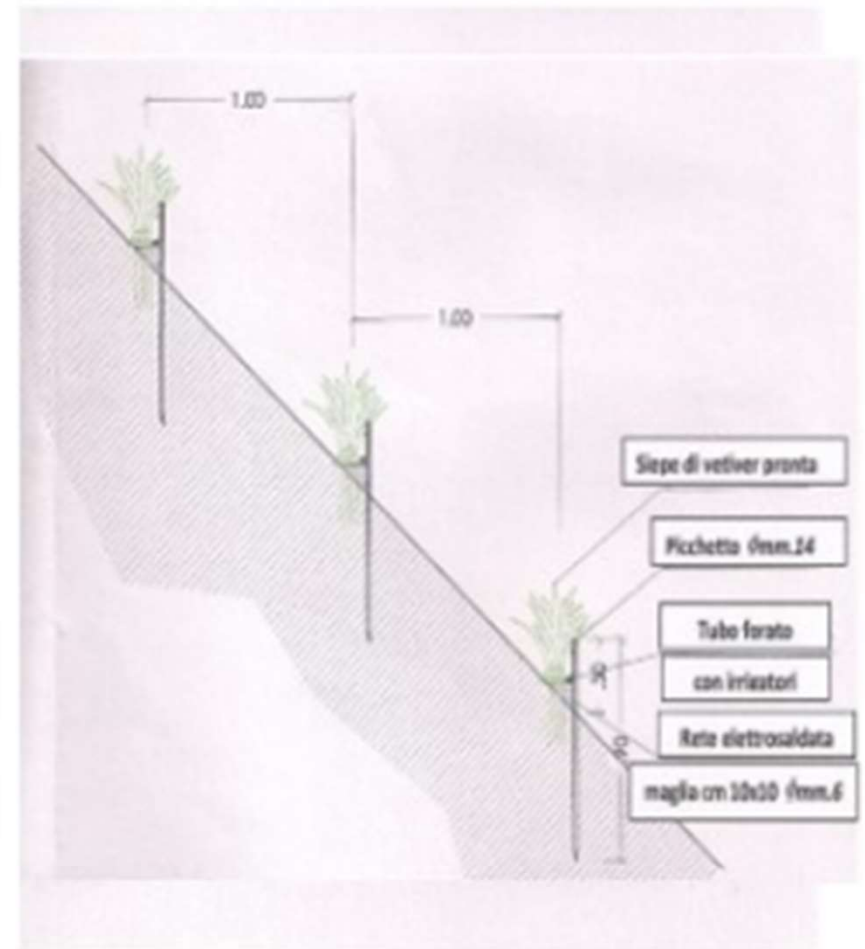
**or in alternative the ready-to-use Vetiver hedge with the Rapid Rooting System (RRS).**

**The irrigation system is also indicated, since it is necessary for the first months in order to accelerate the development of the plants.**

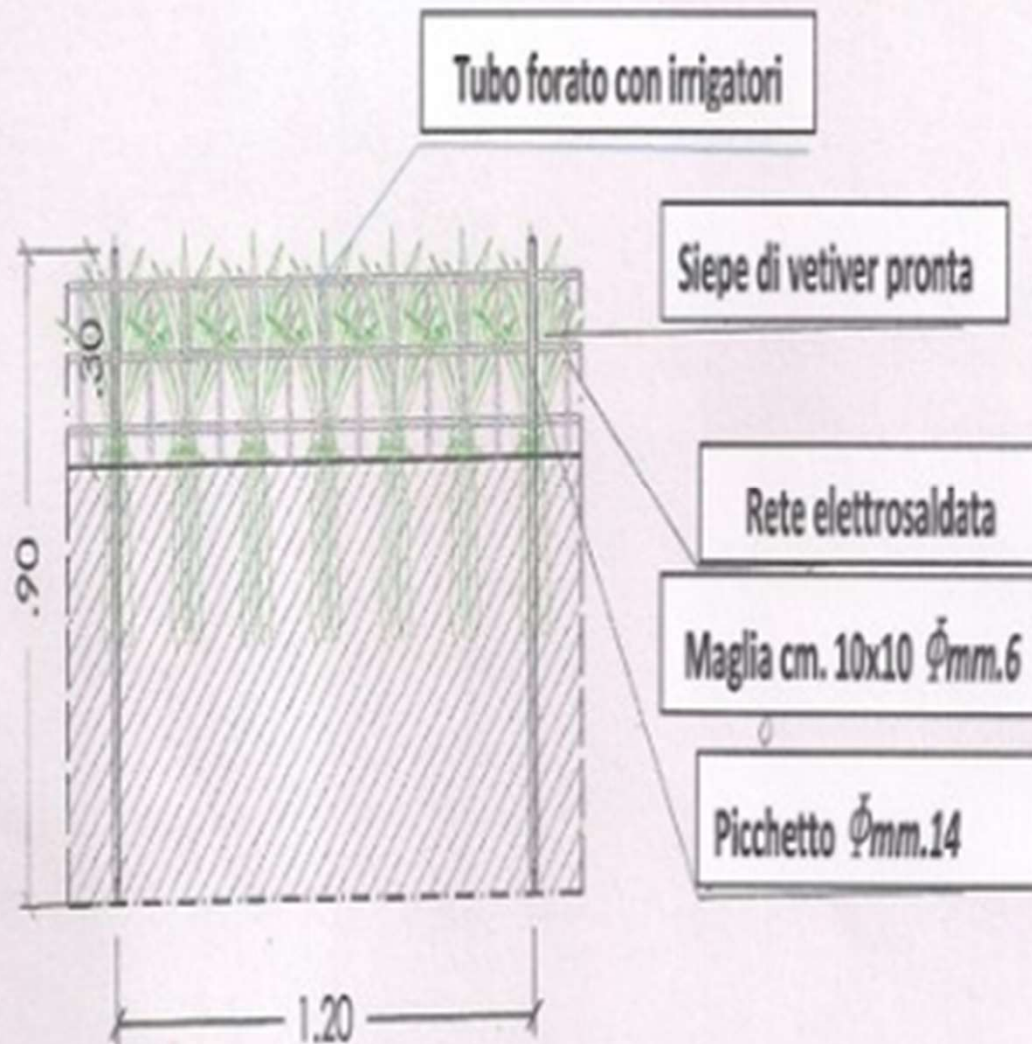




**Horizontal view**



**Vertical view**



**Frontal view**

## NOTA:

Le siepi vengono poste ad ogni metro di dislivello, lungo le curve di livello o isoipse, formando una barriera filtrante, barriera, che consente solo all'acqua piovana e ai limi sottili di trascinare verso valle. L'acqua, trovando questa barriera filtrante orizzontale, traccina punto per punto, evitando così le canne, che nella maggior parte dei casi vengono smantellate dalla furia degli eventi, inoltre, rallenta la sua velocità, ricarica le falde acquifere, mantiene l'umidità nel suolo e protegge i semi delle piante annuali, assicurando un raccolto uniforme e più abbondante.

Poste lungo le rive dei fiumi, le siepi di vetiver oltre a consolidare gli argini e bonificare l'acqua, svolgono un lavoro di automanutenzione. Infatti, dove il fiume esonda, al rientro dell'acqua nell'alveo del fiume i detriti si accumulano a ridosso delle siepi e innalzano gli argini.

**A week after the work was completed, a cloudburst caused a 'water bomb' at the site, but no damage was done.**

**About 10 days later, there was a second 'water bomb', which confirmed that the system was working.**



**The intervention in Morlupo with our Vetiver Hedge Simulator**

**These experiences were followed by a series of projects using also the Ready-to-use Vetiver Hedge.**

**It gave us the idea to present a Project with the Ready-to-use Vetiver Hedge to solve the problem of raising the banks of the Ufente River, which is the subject of this presentation.**

**In this case too, the construction companies which participated and some of the environmentalists present opposed the use of Vetiver, pointing out that it is not a native plant.**

**My reply:**

- Since the lands of the Agro Pontino Reclamation were constructed and are not natural areas, nothing is indigenous to them.**
- Vetiver was not being used as an ornamental plant, but for its efficiency and uniqueness in solving that specific environmental problem.**

**- My 'Rule of Three' for the Use of Non-native Plants:**

- 1) That they be useful for the intended purpose. In this specific case, Vetiver was indispensable.**
- 2) That they not be invasive. And the Monto quality we grow is sterile.**
- 3) That they can be eliminated without resorting to polluting systems. And to eliminate Vetiver, manual (or at most mechanical) systems are sufficient. Furthermore, the uprooted Vetiver can be separated, obtaining a multiplication of the original plants.**

**In 2021, the initiative of the Lazio Region to activate the River Contracts was an opportunity to present the Project for raising the embankments.**

**The Consortium was convinced of the plan presented by Latium Vetiver to resolve the problem implementing the Rapid Rooting System and the Ready-to-use Vetiver Hedge.**



# **CONCLUSIONS**

**Objectives of this Presentation were:**

- 1. To demonstrate the importance of the Vetiver Technology developed - the Ready-to-use Vetiver Hedge, the Vetiver Hedge Simulator in a system of Integrated Environmental Architecture**
- 2. As we have seen, Vetiver proves to be the only viable solution for raising the embankments of the Ufente River to their pristine state in a very short time.**

**3. To suggest ways of overcoming resistances to the use of Vetiver by explaining Vetiver Technology and using the 'Rule-of-Three' for Non-native Plants**

**4. To make the uses of Vetiver known to students in related fields: for example, via courses like the one I taught on Vetiver for Soil Reclamation in the Department of Agricultural and Agro-Industrial Economics at the University of Cassino.**

**5. To encourage collaboration with Universities and Research Centers:**

- to create a work/research symbiosis
- to promote and disseminate the use of Vetiver Grass Technology
- to guarantee involvement of university facilities, to demonstrate the efficiency of Vetiver Grass Technology scientifically

**6. To explore innovative uses of Vetiver: the production of green methane or biomass, the direct removal of CO<sub>2</sub> from the atmosphere, etc.**

**The Fundamental Mission: to make all these possibilities for Vetiver use known in a convincing way**

**- in the private and public sectors,**

**-to young people studying to become the experts of the future**

**who are generally open to innovation,**

**who have no interests of their own to defend,**

**who are interested in tackling the problems caused by climate change with passion and commitment**

# **VETIVER THANKS YOU!**

**Latium Vetiver di Benito Castorina**

**Via Savuto, 38. Aprilia (LT) - Italy**

**[bcastorina@gmail.com](mailto:bcastorina@gmail.com)**

**<https://www.latiumvetiver.it>**