THE EUROPEAN AND MEDITERRANEAN VETIVER NETWORK (EMVN)

A Periodic Newsletter

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Fact Sheets (FS)

In EMVN we experience a problem that is probably shared elsewhere. This is the difficulty in breaking through the barrier that often exists amongst technicians of one discipline against the introduction of a technology from another discipline. For example, this can occur in the case of engineers who have traditionally used engineering means to resolve their constructional problems. The concept of addressing an engineering problem by means of a vegetative solution can be foreign to some and requires a specifically targeted approach in introducing the cross-discipline solution.

Harry Nijpels and I have drafted a one-page hand-out that aims to set out clearly and concisely the technology that we are promoting (The Vetiver System) on a problem and solution basis, in this instance 'Road Works Stabilization'. It is included as a separate attachment to this Newsletter. I invite comments and suggestions on its improvement.

When we have got the FS into acceptable shape we intend to have it translated into languages appropriate for EMVN.

We will also produce similar, one-page FS with photographs for various other usages of the VS. These could include: agriculture, forestry, pollution control, dam protection, dune stabilization, waterway protection, mine dump stabilization, disaster mitigation, environmental protection, effluent control, aesthetic use in urban development, landscaping and horticultural use and rural economics.

The FS would be used to stimulate initial interest in the VS and would be followed up by use of other promotional material, for example, the TVN brochures.

The choice of comparative photographic images is a critical ingredient as they attract

We would appreciate receiving more photographs that depict 'before and after' and 'with and without' scenarios (see below) for use in Fact Sheets.

Photographic Images

Following on from the above comments on Fact Sheets I think there is need for a broader selection of 'before and after' and 'with and without' photographic images. We already have some good 'with and without' scenes relative to bio engineering, frost and fire tolerance and pollution control. However, we seem to lack 'before and after' scenes relative to, for instance, small-scale agriculture. Such comparative photography can be a useful extension tool, clearly demonstrating the effectiveness of the VS under practical field conditions. We would appreciate receiving photographic contributions.

Saline Soil Absorption

Criss Juliard, writing from Senegal to the Network's Discussion Board raised some questions regarding Vetiver's tolerance to saline conditions. Two specific problems arise in Senegal. Firstly, a rising salt water table, less than 1m deep; and secondly, fields that are abandoned because of the soil's high saline content. Criss asks the following questions and perhaps someone in EMVN might care to comment.

1. What is Vetiver's ability to clean or reduce the soil's salt content? Studies show that Vetiver is tolerant to salt water; however, the issue that he raises is whether the plant actually soaks up mineral salts.
2. What is Vetiver's ability to stop salt water from intruding low lying lands through its root barrier system?
3. When the salty water is near the surface, will the capillary action raise the salt water

table or will the absorption properties of the plant overtake the 'biological pump' action?

Discussion Board

The Network Discussion Board to be found at www.vetiver.com/discus has been active for some time and members are encouraged to make use of this facility. I am inclined to the view that I should probably cease putting out these periodic newsletters in favour of encouraging use of the Discussion Board and The Vetiver Network's WebSite that includes a section for EMVN affairs. Comments are invited. It would certainly make my life easier.

Definitions

From time to time within the Network we argue our way through definitions. One, for example, is 'phytoremediation' and 'biodepuration'. Generally, the former seems to have been used within the Network to mean 'The ability of plants to remove/fix/render harmless or reduce the toxicities of chemical pollutants and heavy metals'. However, biodepuration has also been used. A dictionary definition of this is 'to free or become free from morbid matters or impurities'. So, in principle, the use of the word is not wrong. However, from comments that I received when I opened the matter for discussion within the Network, we seem generally agreed that 'phytoremediation' is the standard word we should use.

Interestingly, Vito Sardo has started some new experimental work on the depuration of saline soils in Catania University, Sicily. He describes this as 'phytoreclamation'. That's the first time I have come across this classification. It seems to me to be clear and appropriate.

Another definition that has caused some controversy is the use of the words 'tiller' and 'slip'. Narong Chomchalow, who taught botany at university, has strong feelings on the matter. He considers that tiller is the word that we should use for 'a shoot that emerges from the base of the stem of a plant'. The important issue in the case of Vetiver is that tillers grow from what I would describe as the crown, i.e. that base part of the plant immediately below the ground from which upright leaf growth occurs and below which roots grow. Note, tillers do not grow from the roots, as is the case in many plants. Slip is a word that I feel has grown and become customary within Vetiver technology. I regard the use of the word 'slip' as being essentially for field application, rather than pure botany, and Narong is happy with my definition that a slip consists of 2 or more tillers used in planting a station. Incidentally, Vetiver shoots always grow from the stem, never from the roots.

Vetiver Mulch

A recent note from John Greenfield in New Zealand is worth passing on regarding the fungicidal, pesticidal and virucidal benefits of Vetiver mulch. Scientific data on the matter appears not to be available but anecdotal or observed benefits have been noted. These show that where Vetiver hedges have been cut back to encourage new tillering, growth and plant robustness fungal attacks on the mulched plants have virtually disappeared and there appears to be little, if any, pest activity around the host plant.

Of course, as has been stated on various occasions, mulch produced from Vetiver is particularly valuable since it has a good moisture absorption factor and breaks down quite slowly.

I use the trimmings from mature plantings as between-row mulch for new plantings in my nursery, here in Portugal. This makes my life easier as the need for weeding of new plants is diminished and the need for watering much reduced.

Penetrative Power of Vetiver Roots

The question was raised recently as to whether, if Vetiver was planted close to a plastic lined reservoir, the roots would penetrate the plastic in search of the water in the reservoir and whether, therefore, the practice should be discouraged.

I think there is no doubt at all, confirmed by John Greenfield, that Vetiver does not present a problem under such circumstances. On the contrary, Vetiver hedgerows provide an excellent soil stabilizer around plastic lined reservoirs because they descend vertically in search of water, not horizontally.

But Criss Juliard contributes valuably that it is best to plant the Vetiver hedgerow say 50cm below the HDPE lip.

As has been shown scientifically by Diti Hengchaovanich, Vetiver roots have an extremely strong tensile strength. Furthermore, they have remarkable penetrative capabilities under hostile soil conditions where they will penetrate hardpans to find deeper lying moisture, under which conditions they flourish.

However, these tensile and penetrating strengths are not relevant when the roots meet a sheet of unbroken plastic. In the field, Vetiver's root penetrating capabilities require that they locate tiny cracks in the soil or hardpan through which the hair roots can pass, descend and then expand. These conditions do not prevail in the case of good quality plastic sheeting, i.e. there is no fissure through which the hair roots can pass.

This is clearly demonstrated when young Vetiver plants are allowed to remain in thin plastic tubes beyond their time for field planting. If the bottom of the pot has not been cut open roots will become entangled within the pot, spaghetti like, and the plant will eventually become root-bound. But they will not break through the thin plastic wall of the pot. So they certainly will not penetrate the heavy duty lining of a reservoir. (But, see p 7).

Effluent Control

The question was raised recently as to whether Vetiver would be affected adversely by the presence of grey or black waters from effluents. On the contrary, as shown in Australia, for example, Vetiver thrives on such conditions having the ability to absorb nutrients from these wastes and to flourish on the increased water availability. In the process they purify the effluent, reducing odour.

I live in the countryside where there is no public sewerage system. Instead we have a cesspit and soak-aways. However, the soak-aways are not too effective because our soil is a heavy calcareous clay. When we have many people in the house the system cannot cope satisfactorily with the quantities of grey and black water effluents that result.

In February of this year, in an effort to combat the problem of effluent odour, I planted 11 Vetiver hedgerows in the vicinity of the soak-aways, none more than 4m long, with an in-row spacing of 10cm and 70cm between rows. The reason for the 70cm spacing is purely aesthetic as the hedgerows will be very visible when approaching the house and, hopefully, will make an attractive garden feature especially if kept well watered and with regular trimming.

I do not expect to be able to report on the results of this practical experiment for at least two years by when the roots will have descended well and should be full functional.

Incidentally, February is the earliest I have planted Vetiver in this part of the world. Normally, I have dissuaded others from planting so early when soil temperatures are low and, in our case, when frosts can still occur. However, I seem to have got away with it as has another grower not far away. We have had a relatively warm, wet winter, the plants have grown well and losses have been few. Now, I have to rethink my advice to others regarding optimal planting dates.

On another incidental note to the above we have several orange and lemon trees in the area of the soak-aways. As far as possible, I have kept the Vetiver plantings clear of the shade from these trees. Vetiver cannot withstand excessive shading.

Earthworms

The December 2000 edition of this Newsletter included a brief comment on the subject of earthworms and their inter-relationship with Vetiver grass.

Earlier this year I dug up a number of mature plants from my nursery to meet a demand for slips. In the process I noted that there was considerable earthworm activity amongst and within the proximity of the roots. Obviously this earthworm activity is good news for the opening up of soil and the increased permeation of water between hedgerows that, under farmers' field conditions, should lead to increased yields of crops grown between hedgerows.

Some years ago Doral Kemper showed in Iowa, USA that earthworm activity within and adjacent to switch grass (Trypsacum dactyloides) hedgerows was considerable and that this activity expanded outwards away from the hedgerow some distance into the nearby crop lands. The earthworms apparently found the hedgerows an attractive breeding environment. It would be a reasonable assumption that Vetiver would act in similar manner to the switch grass hedgerows. If so, this would be a big plus for Vetiver, especially at a time when we are focusing on the impact of Vetiver in water conservation, retention and use.

It also raises another interesting question regarding the repellant factor of vetiver roots to certain insects. On the one hand, it has long been established domestic practice that ground up Vetiver roots and leaves repel certain insects and pests. Furthermore, there appears to be strong indication that, in the field, nematodes are repelled by Vetiver roots. If this is so, why is it that in the case of earthworms one has an apparently totally contradictory situation where the earthworms, far from being repelled, flourish in the proximity of Vetiver roots?

Comments are invited and, perhaps, an entomologist or biologist would comment on the sensory attributes of earthworms compared to other insects, e.g. nematodes.

Root Growth Enhancer

Earlier in the year I had to prepare some Vetiver plants for potting so that they will appear as a mini-hedgerow for a public exhibition later in the year. In order to stimulate rapid root growth I applied a root growth enhancer (RGE), obtained from a nearby garden center. Incidentally, for Vetiver-like root growth one should not use the RGE that is used in horticulture for cuttings. I mixed the correct RGE in well with my potting mixture as it is quite strong and could burn the roots.

A home-mixed RGE might, I think be prepared by mixing acetic acid with beta napthol using say, Fullers Earth Mixture as a medium.

Comments on the effectiveness of RGE are invited; also as to whether there is significant advantage to be obtained by using a RGE in the first place.

My own small experiment suggested that those potted plants that had received RGE did show some improved growth compared with some other plantings that I had made at the same time but direct into the field. Overall, I could not conclude that the cost justified the gain.

Double Hedgerows

I understand that world demand for Vetiver oil has increased somewhat in recent years. This may be attributable in part to the increased use of Vetiver oil for aromatherapy purposes. This potential increase in cash income from Vetiver has both positive and negative aspects. Positively, the cash income could attract small-scale farmers to plant Vetiver hedgerows, where a market for oil exists. Negatively, there is the danger that farmers could be encouraged to remove plants from a soil conservation barrier for cash earning and, thereby, destroy the soil and water conservation attributes of the hedgerow barrier.

Comment is invited as to whether the planting of a double hedgerow barrier would be a solution to this problem and whether it is a practical proposition to a smallholder whose land resource is limited. With a double hedgerow one hedgerow would be harvested say every two years for oil extraction from its roots, leaving the other to act as the soil and water conservation barrier. The harvested hedge would then be replanted and the system of alternate harvesting continued ad infinitum.

Steep Slope Stabilization

I have made some extracts from a recent contribution by John Greenfield and others to the Discussion Board that I feel are worth repeating in this Newsletter.

The problem at issue was the stabilization of a near-vertical slope in East Bali, Indonesia. Firstly, the slope was cut to a more stable, manageable grade (2.5:1) with some terraces included. Originally, the plan was to stabilize with fast growing species of trees. However, on reflection, this was changed to substitute Vetiver grass in the first instance with the trees coming in as the secondary approach to soil stabilization. This is, I believe, our standard order of priorities within our Network.

John then contributed the useful 'Angle of Repose' test for such conditions. "Take a representative soil sample from the cutting, wet it to make a 'brick' and then place it carefully in a bucket of clear water, leaving it to stand for some hours. Gradually, it will 'melt' down to a shape like a mound of sugar. The angle of its sides, once it has stopped melting is its 'angle of repose'. Under such soil conditions, cuttings made steeper than this angle of repose will fail unless supported in some way. Vetiver hedgerows will nail down this melt rapidly and prevent it spreading laterally. Importantly, the tree establishment, whether by man or by nature, that by itself will not control the soil slip, should not be undertaken until after the Vetiver has stabilized the slope.

Carbon Dioxide Sequestration

The following is extracted from some comments by Mike Benge, Senior Forestry Advisor of the USDA Forest Service who contributes valuably to the debate on carbon sequestration that has featured in earlier editions of this Newsletter.

"…The use of contour hedgerows of Vetiver in sloping farm fields in Central America reduced erosion by 98 Mt/ha/yr to less than 1Mt." Mike Benge points out that when this is combined with the carbon from the Vetiver and if trees are then planted behind the hedgerows it can do more for carbon retention/sequestration than reducing illegal logging.

More of the Same

Also on the subject of CO_2 sequestration Jim Smyle dug out the following that I think is worth passing on. It is an extract from the

work of Follett et al. (2001) and Lal et al. (1998) and shows the potential rates of carbon sequestration in kg of carbon per ha per year due to improved land management practices.

Improved pastureland management:	
Commercial fertilizer applications	100-200
Manure applications	200-500
Use of improved plant species	100-300
Improved grazing management	300-1300
N. fert. of mountain meadows	100 -200
Restoration of eroded soils	50-200
Restoration of mined lands	1000-2000
Conversion - cropland to pasture	400-1200
Conversion - crop to natural vegtn.	600-900
conventional to conservation tillage:	
No till	500
Mulch till	500
Ridge till	500

News from the Region

Recently I supplied plants to Rens van Beek of Eco-Slopes for use on their EC-funded experimental station located about half way between Alicante and Valencia in Spain. We will follow progress with interest as it could have considerable influence on other potential users in Southern Spain.

Our latest geographic expansion in the region is to The Canary Islands. Sandy Robertson supplied the plants and, reports are that they are growing well. The Canaries have climatic conditions that should favour good Vetiver growth. One potential use on the archipelago is as windbreaks since wind-blow is a significant problem.

In March we supplied some plants to Sylvie Marcacci of Lausanne University where she is conducting experimental work under controlled environment conditions on the phytoremediation capabilities of Vetiver.

Recently we have become aware of some prices charged by Vetiver slip suppliers outside our EMVN boundaries. I suggest that for EMVN requirements prices be sought also from within the region. Considerable savings could result!

Vetiver in Mediterranean Region

Dr. Vito Sardo, working in Catania, Sicily has drawn some valuable conclusions on the performance of Vetiver under Mediterranean conditions.

I feel that what Vito has concluded is relevant to most conditions where Vetiver could be reasonably considered for use within EMVN. He writes:

"After six years with Vetiver plants of the 'Monto' seedless variety, the following conclusions can be drawn:

- Vetiver grass in the Mediterranean environment can thrive satisfactorily as long as it is well irrigated.
- However, the growth rate is far lower than reported in the literature referring to tropical environments, the principal limitation depending on soil and atmosphere temperature - to initiate growth, in fact soil temperature must exceed 18º C.
- Vetiver grass can survive long periods (even months) of water submersion.
- Under the experimental conditions (37º latitude, sea level elevation, fully irrigated, loamy soil) the above ground biomass production averaged about 20 Mg/ha dry matter/year.
- Root development was in all cases much less than reported in the literature, never exceeding 1m depth.
- Hedges formed to protect soils from run-off and erosion are efficient and reasonably fast to form (one season).
- While growing vigorously even under extremely high temperatures (46º C), Vetiver grass can survive low temperatures (even lower than zero Celsius) but growth is arrested.
- No pest or disease was detected during the six years of observation.
- In no case did Vetiver grass show the tendency to expand and become a weed; conversely, no weed could grow in the Vetiver grass fields.
- Vetiver grass showed an appreciable efficiency in the depuration of urban wastes.
- Vetiver grass showed an unexpected tolerance to salinity."

Leaf Height & Root Depth

A number of questions arise from Vito Sardo's findings noted above.

Annual precipitation in Catania is normally about 600 mm but in recent years has been around 300 mm. Under these conditions leaf height varied between 1m and 1m 50 cms.

In the Algarve, Portugal, various field applications of Vetiver during the past 4 years have shown that, under irrigation and plant feeding, leaf growth will reach 2m or even exceed it. Root development has not been

measured. It certainly does not reach the depths recorded in the literature for tropical regions, i.e. 3-5m. However, it may exceed the 1m recorded scientifically by Dr. Sardo. Annual precipitation in those areas where Vetiver is growing in the Algarve varies from say 400 - 800 mm per annum.

There is probably little question that, in those southern parts of the EMVN Region where climatic conditions permit the establishment of Vetiver, plants will grow at a less rapid rate and reach a lower ultimate level of growth for both leaf height and root development.

This raises the question as to what are the critical leaf heights and root depths for effective hedgerow establishment to control erosion and water run-off.

I suggest that the critical height of dense, above-ground mass may be no more than 60-70 cm except where the purpose of the hedgerow is to act as a wind-break. A hedgerow of say 1m - 1m 50 cms maximum leaf height would still have an effectively dense mass to control erosion and run-off at say 60-70 cm. If this surmise is correct, then it matters not if, under EMVN conditions, plants reach not much more than 1m 50 cms. in leaf height.

Root depth and density is more critical. I am not aware of data that establishes the critical depth/density factors. However, it is probably reasonable to surmise, for the time being, that providing root depth is not less than say 1m and that root density is good, soil 'nailing', control of tunneling and overall surface and subterranean soil cohesion will be adequate. Criss Juliard comments that 'root mass' is more critical than 'root depth' in nailing the soil to prevent erosion. Incidentally, he has also found that pig manure is more effective in promoting extensive root growth than other manures.

There is also the question as to whether there is any correlation between leaf height and root growth. In Catania, under conditions of plant maturity, Vito obtains a root depth of about 50% leaf height. In the Algarve we know that plants can reach in excess of 2m leaf height under irrigated conditions and 1m to 1m 50 cm under conditions of precipitation only.

A point that should also be taken into consideration is that the plant feeding that results in leaf height exceeding 2m in the Algarve may not necessarily result in increased root depth. In fact, the contrary might be true since adequate plant food becomes available at a lesser depth and there becomes no stress factor that would otherwise induce the plants to extend their roots downwards

One final point for consideration is the impact, if any, on drainage capability and replenishment of subterranean water resources that result from 'our' EMVN short rooted Vetiver as against tropical, long-rooted Vetiver.

Dead Wood!

In Dick Grimshaw's report on his recent visit to China he mentions the desirability of removing 'dead woody stem material' (dwsm) from planting material. I think this merits discussion.

In has always been my practice to prepare really nice looking slips and this, of course, involves removal of the dwsm. It is unsightly, gets in the way and would not be viewed favourably by an agricultural inspector if the plants were for export. But, as far as I am aware, the dwsm harbours no pest or disease and causes no harm to the living plant. So, if it were not for the unsightliness the dwsm could be left on.

I have made a very approximate estimate of my work break-down for plant preparation. But my figures should be viewed in the light that my nursery is sited on heavy clay soil, whereas a good nursery site should be on light sandy soil. Also, a fully operational nursery would certainly have mother plants no older than 2 years, perhaps mostly one year. In my case the mother plants are 4 years old and have been trimmed back 4 times in their lives. So I have a lot more dwsm than one would expect in a commercial nursery.

Digging out and Removal of main clods	10%
Soaking and splitting into Manageable chunks	15%
Trimming leaves to 20cm and Roots to 10cm	10%
Washing	5%
Removal of dwsm and Washing again	50%
Counting into bundles	10%

Put a cost on the labour involved and the cost of removing the dwsm then becomes debatable. I would certainly never supply for sale plants that were not carefully selected and prepared with all dwsm removed. However, if I was dealing with thousands of plants rather than the few that I supply I would consider carefully whether it was worthwhile removing the dwsm, especially if the plants were destined for local use.

DNA Trial

I have mentioned in an earlier Newsletter the fact that we have an ongoing trial of various Vetiver accessions in my small nursery in the Algarve. This is part of the much wider international trial that is directed by Bob Adams from The Pacific Centre for Molecular Diversity in Hawaii. For general information the accessions that we are examining in their performance under our climatic and soil conditions are from: USA, Sri Lanka, Malawi, Costa Rica, Panama and Malaysia,

The latest additions are some plants supplied by T.D. Hong of Reading University. We call these 'Euro-Vetiver' because they originate from Kew Botanical Gardens in England who, in turn, got their original stock from Wilhelmshoe Bergpark Gardens, Kassel. I commented on these plants under a piece entitled 'Detective Story' in EMVN Newsletter Nº 6 of December 2001.

CD-ROM

I mentioned in Newsletter Nº 6 of December, 2001 that Harry Nijpels and I had produced a CD-ROM that is designed to permit anyone, not necessarily particularly knowledgeable about the VS to make a presentation on the technology to an audience that is not necessarily conversant with the subject. We are now in the process of having this translated into German, Italian, French, Portuguese and Spanish. Leo Toledano is producing a Hebrew version.

Book on Vetiver

Professor Massimo Maffei of Turin University, Italy recently published his well assembled and produced book, 'The Genus Vetiveria'. The book consists of nine chapters by twelve authors and describes the anatomy, physiology, biochemistry, essential oil biogenesis and chemical composition, ethopharmacology, distillation as well as production of plants for oil exploitation and for the use of Vetiver as an ecological tool against erosion, flood, soil pollution and many other applications. The book is published by Taylor and Francis of London and New York. The ISBN is 0-415-27586-5.

Overstory (overstory@agroforester.com)

The EMVN newsletter has commented previously on this valuable, free publication. Edition #103 on 'Land Management' is worth drawing to attention. The VS fits in particularly appropriately to the concept of sustainable land management since its use is aimed at the effects within the farming system of erosion, loss of organic matter and plant nutrients. The VS is a technical innovation but, by its nature, it is also one that fully interacts with the social needs of land users.

Donations

From time to time well-wishers of this Newsletter send EMVN donations. They are most gratefully received. However, a recent example points to the need to consider cheapest and best means of making such transfers. In this recent case a sum of _35 was transferred from one donor's bank within the EC to the EMVN account in Portugal by 'Swiftway', an expensive but secure method of making a money transfer. On receipt, the EMVN account was debited _20 commission and _0.80 in stamp duty, or about 60% of the value of the transaction! Alternative means of making such donations should be considered. One is by 'Western Union' which is relatively cheap and quick. Another is by postal order. A third that is now attractive within the common currency of the EC is simply to send the donation in cash by mail, preferably registered, as has been done successfully in the past.

Stop Press!

I have just read on the Discussion Board Hanping Xia's findings that Vetiver roots can penetrate plastic sheeting. This runs contrary to my comments on the penetrative power of Vetiver roots in page 2 above. My experience is as stated, so I think we need to investigate this issue further.

HomePage and EMVN Coordinator

Information on the Vetiver Network and the Vetiver System can be viewed on http://www.vetiver.org. There is a section on EMVN affairs. I can be contacted at Quinta das Espargosas, Odiaxere, 8600-250 Lagos, Algarve, Portugal; tel/fax: +351 (282) 798 466; e-mail: mikepease@mail.telepac.pt