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REPORT ON VETIVER GRASS

FOR

EROSION CONTROL

IN

HONG KONG

by

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Report on Vetiver Grass for Erosion Control in Hong Kong

Vetiveria zinzanoides, an erect grass, is being actively promoted for use in erosion control, particularly by the World Bank. It has, however, long been grown in Fuji for control of potentially-severe sediment loss from rolling terrain used for growing sugar and in many other tropical and subtropical areas. According to reports its main advantages are:

1. grows readily in most soils and is not liable to pests

2. does not require fertilizer for establishment or maintenance

3. does not ramify or set fertile seed and consequently is safe to use for erosion control in crops

4. survives dry seasons because it is deep-rooting

5. has a stiff, erect habit and consequently traps moving sediment readily

6. is not particularly attractive to grazing animals and consequently survives grazing

Vetiver has not previously been planted in Hong Kong, so far as is known, although the territory has significant areas of eroding badland, mainly on weathered granite, and many artificially-cut slopes, most of which are currently hydro-seeded. Current experiments are in progress to assess the effectiveness and costs of planting Vetiver for erosion control.

Experiments at Kadoorie Agricultural Research Centre (KARC) A Cut Slope

This experiment was initially designed to multiply Vetiver and to test its suitability locally. Financial support (H.K.$2,000) came from the Shell Better Environment Awards Scheme. Remaining costs were met by KARC.

Phase I Multiplication

Mother stock was purchased from the South China Institute of Botany (courtesy Professor Diana Chau Tak Chiu) in July 1990 and planted out on a terrace at KARC on 7-8 July 1990, the soil being sawdust/pig waste mixture over decomposed granite. Initial growth was excellent, no significant pests being observed. No other fertilization or irrigation was done.

Phase II Planting

All 'mother-stock' was lifted, divided and planted in July 1991, rather later than necessary. Half was replanted on a terrace for further multiplication, the remainder in double rows, on the contour, at one metre vertical interval on a soil derived from old volcanics with a 40° cut slope (1-7-91). Both have made good growth subsequently with the cut-slope planting holding back large pebbles 1-2 kg in weight as well, by June 1992, as approximately 5-7 cm of sediment accumulated on the upslope side of the rows. Plantings seem sensitive to moisture conditions, the contour rows lower on the slope making better growth than those higher up, though the latter nevertheless function effectively. In March 1992 the Vetiver on the slope was cut back to about 50 cm height and the cuttings laid behind each row as a mulch. Decomposition was fairly slow as the material quickly dried out but a useful addition of organic matter was made to a soil previously lacking it completely. Over time native grasses and herbs have established themselves between the rows and vegetative cover is increasing steadily.

Phase III Fertilizer Treatment

This Phase will be initiated in late June/early July 1992 as more planting material becomes available. Planting will be on an extension of the original cut slope at KARC, using the same double-row planting pattern. It will take the form of a single split-plot trial, control - no fertilizer, trial - mixed sawdust/pig waste. Sawdust/pig waste is readily available (for the cost of carriage and application).

B Terrace

This experiment was designed to assess the performance of Vetiver on decomposed granite. This material is quite widespread in H.K., both *in situ*, where badlands may be formed, and in 'artificial' fill. The terrace comprised decomposed granite fill (over weathered colluvium) 20 cm deep, loose and highly erodible.

Vetiver was planted along the outer margin of the terrace in a double, in places a triple, row. Unfortunately, contrary to instruction, most of the planting was at 30 cm spacing instead of 20 cm. Planting took place in early September in order to test its performance under extreme conditions. Decomposed granite is very low in nutrients. Planting was without fertilizer and no irrigation other than a good soaking at planting. Other than wash-outs, survival was excellent with only two slips failing to strike. The slips made little growth during the dry season but by late February 1992 new growth was visible and at time of writing most plants are reasonably vigorous.

There are, however, two related problems at this site. First is that since decomposed granite comprises mainly medium to coarse sand, with a little clay, some sediment appears readily to flow between the clumps at times of high rainfall intensity and run-off consequently is not effectively trapped. Second, some concentration of run-off occurred as a result of the original shape of the decomposed granite surface. Small rills developed in which the rate of sediment removal was so high as to wash out the slips. Despite specific instructions in March 1992, it appears that no replacement planting has been done in these rills. It is recommended that such planting be deep and sufficiently close to trap moving sediment i.e. with slips touching each other.

It is clear that decomposed granite is so erodible that prompt 'patching' of any rills that develop must be undertaken, employing very close planting and fertilizer application (in the planting hole) to encourage good strike and rapid growth. It should be noted that the growing point of Vetiver is said to be 'semi-subterranean' so that moderately-deep planting, to resist mechanically the flow of water and sediment, should succeed. However, no details are currently available on just what the maximum effective planting depth might be nor is experimentation on this subject now under way.

The most important positive finding of this experiment thus far is that Vetiver will survive the dry season very well, making fair growth as soil moisture and temperatures increase in spring. This has important implications for labour utilization since unlike plantings of trees and hydro-seeding there appears to be no limited 'window of opportunity' for planting and achievement of a good strike rate.

Experiment at Jordan Valley, Kowloon

This has been undertakers by T.D.D. using Vetiver slips supplied by KARC Plantings were undertaken, with Alginure, both in rills and on slopes, on *in situ* decomposed granite terrain in January 1992. Although there were similar problems of an excessive planting distance between slips (25-30 cm instead of 20 cm as recommended) and wash-outs in rills, establishment has been very good. The strike-rate is about 99% excluding wash-outs.

Prompt patching of rows planted in rills is also required at this site. Some possible disease problems have shown up here - a rust and possibly stem-rot. But this is not to be wondered at given that Spring 1992 is the wettest on record. Close watch will need to be kept on this aspect since rust nor stem-not have been detected at KARC.

The problems of rilling and excessive spacing of slips at planting exist here as at KARC. It is recommended that a trial be made with single-row planting at 10 cm spacing, strictly on the contour, be made at this site which is quite typical of much badland terrain (except in respect of its close proximity to the urban area). Prompt 'patching' will be essential.

On the positive side, this experiment partly confirms that dry-season planting is a feasible option although from February on rainfall was exceptionally large and very intense.

Erosion pins to measure erosion/accumulation behind a row of Vetiver were installed on 19-6-92.

Conclusions

1. Vetiver performs well in H.K. though, expectably, it does better with fertilizer than without.

2. It appears not to be significantly affected by pests or disease though a 'watching brief' is needed, especially for the Jordan Valley site.

3. Dry-season planting is feasible, with a high survival-rate, allowing year-round employment of labour, though little growth can be expected until Spring.

4. Performance on bouldery colluvial soil (which at KARC has a moderate nutrient status) was superior to that on sandy decomposed granite, whether *in situ* or transported, probably because of the very low nutrient status of the latter.

5. Plantings on decomposed granite, especially, need to be exactly on the contour, closer together (maximum 20 cm) and preferably with an initial application of standard NPK fertilizer (or sawdust/pig-waste) in the planting hole.

6. Further trials should be carried out on a variety of terrain.

7. Production of slips needs to be speeded up, e.g. by irrigation and fertilizer application. An 8-12 week cycle should be achievable.

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