SPREADING THE USE OF VETIVER IN THE RURAL CONTEXT OF MADAGASCAR

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Introduction

Vetiver grass was introduced in Madagascar in French colonial times. At that time, its use was strictly limited to the extraction of essential oils. The activity was seen as strategic due to its economic importance and was reserved for the colonists. It was not until 1988 that an agricultural engineer from the World Bank tried to popularize the plant in Madagascar. During a stay in India, he had found out about the success of vetiver in a soil conservation project. Despite its introduction, vetiver could not be popularized appropriately. Since then, there has been little action. However, a few users were pinpointed in certain parts of the northeast and west of the island, where the plant is essentially used to mark plots or as landmarks for planted areas.

In 1996, the managing director of the Association Nationale d'Actions Environnementales (ANAE) participated in the First International Conference on Vetiver in Chiang Rai, Thailand, and brought back some vetiver samples to Madagascar. From these first stumps, ANAE built up a strategy to promote vetiver use over the island

Context

Madagascar is one of the countries where the problems of soil erosion are known to be particularly intense. The island's topography represents more than 77% of catchment areas of rivers and streams. For a naturalist, this accelerated erosion is a sign of imbalance between the environment and its use.

According to a World Bank study (cited by Ravel 1989), Madagascar holds the world record for soil erosion, causing considerable damage to agricultural land, infrastructure and coastal ecosystems. In effect, this is the consequence of several natural factors such as the climatic, geological and topographic conditions, but it has been worsened by extremely degrading agricultural practices over the past two decades and by the reduction of the natural vegetative cover through deforestation and bush fires. This reduction of vegetative cover diminishes the organic matter in the soil and rapidly accelerates runoff and erosion. This process of environmental degradation also translates into additional costs in maintaining the productive infrastructure and investments, which worsens an already difficult socio-economic situation.

Pastoral land replaces forest. Repeated fires and clearing to the order of 200 000 ha a year prevent the development of ligneous cover and increase erosion, which removes 2 to 3 million t of soil per year. Only the hardiest vegetation survives (particularly *Aristida*). On lower ground, this translates into the silting-up and sanding of rice fields (10 000 ha are lost each year, equivalent to 20 000 t of rice), silt-laden alluvial planes and estuaries.

In the highlands, the magnitude of *lavaka* (erosion gullies) is a spectacular illustration of the erosion process, which spreads and becomes more serious as time goes on. Road and water infrastructures on these damaged sites, on deep and fragile soils, are unstable, and additional and complementary work is necessary for an adequate system.

The lack of productive land in the narrow fertile valleys, as well as the population explosion, has led farmers to cultivate the *tanety* or hillside slopes with damaging agricultural practices.

The aggressive climate, tropical with a hot rainy season with frequent tropical depressions and a prolonged dry season, the practice of using fire for clearing and soil working techniques without anti-erosion measures, and the inefficiency of texts on ways of working the soil are among the factors encouraging environmental degradation.

ANAE

L'Association Nationale d'Actions Environnementales (ANAE) is the executive agency for soil conservation and improvement of standards of living in the countryside, an aspect of the Environment Program II within the Malagasy Environmental Action Plan (or PAE – Plan d'Action Environnementale). It is composed of an administrative council made up of representatives mainly from the private sector. An executive director backed by regional branches ensures the undertaking of activities.

The main role of ANAE is the management of funds to prepare, undertake and evaluate small-scale projects concerned with soil conservation, and to improve standards of living in erosion priority zones.

The intervention strategy is based on a bottom-up approach, starting from applications for technical or organizational support from rural groups in order to bring out concerns about soil use or agricultural productivity.

ANAE funds the socio-technical aspects of project dossiers for a partnership with operators who monitor and accompany rural groups in realizing their project.

Despite the specificity of its mandate, given the lack of rural infrastructure, absence of a cooperative tradition and repeated deception of rural communities by proponents of development, ANAE has had to invest in methodological and technical questions (Fig. 2) and to provide support for operators and improve farmers' know-how in managing their resources.

Methods of Intervention

Certain practices and methods which did not value land adequately have led to a gradual decline in the upper soil layer and soil fertility. Generated by an explosion in population, this diminishing fertility has added to the negative pressures on the environment. Nevertheless, this state of affairs was supported by the educational and training system, which did little to find out the real needs of people in the countryside and had not bothered to research and experiment with real-life problems.

Furthermore, lack of information and the existence of simple and less expensive technologies led to a conception and realization of major infrastructure projects whose maintenance cost was beyond the capabilities of collective groups, provoking a sort of negligence, even abandonment of existing infrastructures. It is not rare to live in situations where the absence of any alternative leads to a passive attitude where people are used to receiving because of this state of affairs. Nevertheless, many examples can be found throughout the island where farming communities have built up knowledge of several conservation techniques and have undertaken work on a scale they would never have thought possible previously.

ANAE only works with rural groups that have organized themselves and undertake activities to solve a common problem or a number of similar individual problems collectively. The size of the groups depends on the types of activities they are going to perform. In a soil conservation project, an average of 25 families or farmers get together, whereas in work involving infrastructure, whole communities are involved and participants can be as many as 2 200 people or more.

Every participant contributes to the project. Besides helping out physically, participants also bring locally available material for the realization of the project. In addition, they will undertake to repay part of the investment costs.

The collaboration of ANAE with rural groups is simple: after receiving applications from farmers, ANAE undertakes a field visit, discusses and identifies problems, researches and proposes solutions. Once each stage of the process is completed, there is a decision on the partnership, leading to the planning of interventions, preparation of a dossier and a financial contract, followed by an evaluation of the work. ANAE rules and procedures expect a contractually based relationship with its partners.

Intervention principles regroup the various methodological and organizational visions to maximize multiplying knock-on effects. The ANAE financial support favours a training approach to enable farmers to undertake the work in a profitable and sustainable manner. With this, technical and

quantitative results are required, help is geared towards a farmers' organization, considered as a whole institution for a self-sufficient objective. This is the aim of training given to farmers. During the project, this framework permits a progressive handing down of certain tasks to the beneficiaries, who can eventually take on the major work in project realization. It means preparing and executing the work professionally during training. Central to a project are technical assistance and plant supply. During the realization of the project, the first steps are designed so that it is immediately possible to evaluate the concrete benefit of soil conservation through a net retention of the soil by vegetative barriers.

Organization of Small Project Implementation

Small projects in soil conservation are founded at three levels of organization: the regional branches of ANAE, the executive organs of projects, followed by operators, indispensable intermediaries who accompany farmers in carrying out the work, and finally the farmers' groups, the main players in any rural development. This chapter also mentions the reproducibility of actions because of its importance in the implementation of a project.

ANAE Regional Branches

Operating regional branches, as shown in Fig. 1, multiplies ANAE intervention capacities. Regional studies are undertaken in order to prepare elements that will allow a better appreciation of each area and to design strategies for different contexts. In this framework, four criteria are closely examined: erosion, demographic pressure, production potential and community frame of mind. Regional branches determine their own work capacity and are more autonomous in financial management and decision-making.

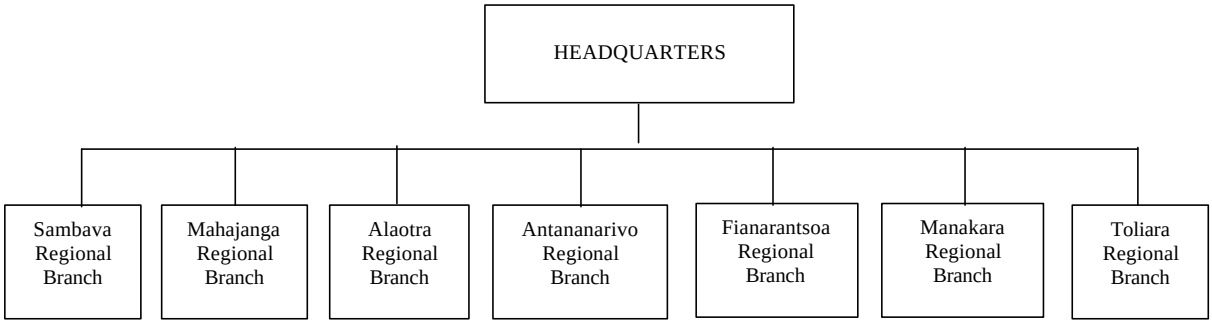

Fig. 1. ANAE organization chart

Operators

Operators collaborate with ANAE to support the implementation of activities with farming communities. They are responsible for the proper execution of the project in the field and guarantee effective and locally adapted apprenticeship training. The main tasks of the operator are centred on the organization and training of farming communities. With the support and backing of operators, farmers organize themselves and carry out the work described in project dossiers, according to recommended techniques and to an established schedule. The aims of the operator's work are to initiate a process of environmental awareness, to transfer organizational and technical knowledge (Fig. 2), to accompany this process by giving a certain amount of encouragement and to leave the communities once the process is sufficiently rooted and adopted.

Reproducibility of Actions

So that the soil conservation product spreads of its own accord within the farming framework, it has to be compatible with farmers' own ambitions and interests. ANAE devotes a lot of energy in developing a technical itinerary that suits this need. The end objective is to contribute in activating a process of

innovation which starts with the horizontal transfer of proposed solutions, from farmer to farmer, from participant to non-participant, towards other non-participants, and so on. The process of horizontal transfer depends on still relatively un-researched parameters which make up farmers' social and economic contexts. One of the ways adopted by ANAE is to organize exchange visits between farmers whose projects are running successfully and those with a weaker performance or just starting up. From these visits, groups that are capable of leading and managing soil conservation projects on a larger scale and shorter implementation times emerge. It is now normal to see one farmers' group carrying out the technical training of another group during a project.

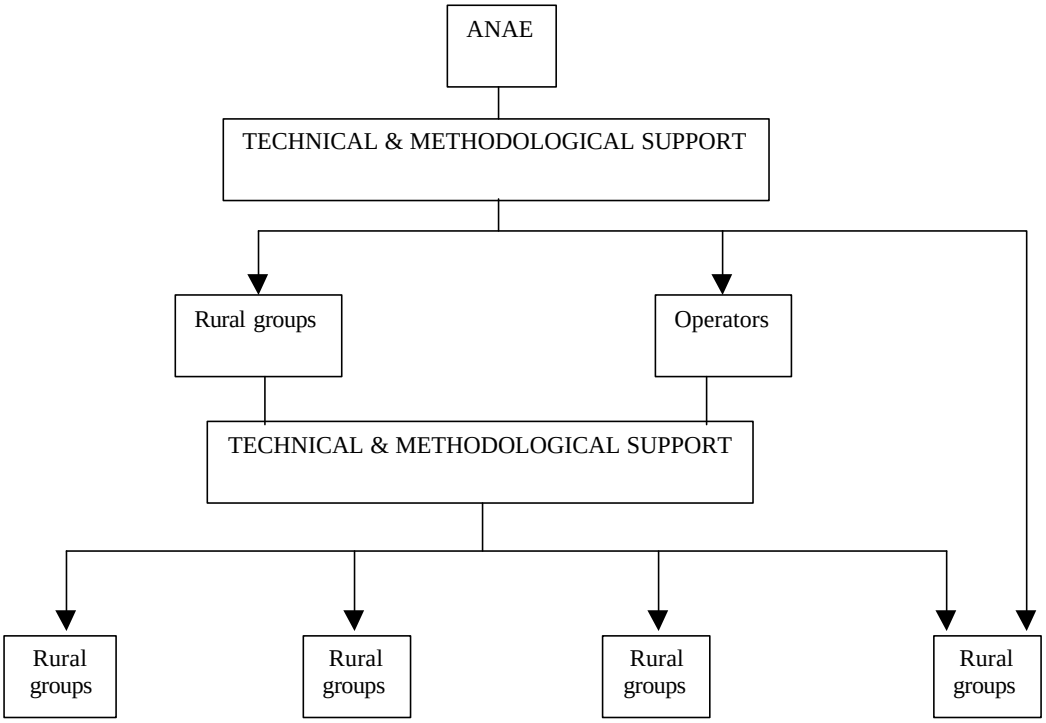

Fig. 2. ANAE-operator-farmer interactions in the implementation of work and transfer of knowledge

Results

The use and production of vetiver has been among the priority of anti-erosion measures for three years in ANAE actions. The seven regional branches apply their own strategy to develop the use of the plant. The need for vetiver stock necessary to carry out protective work is so enormous, given existing problems in each region, that it is impossible to conceive large-scale action for the time being. Nevertheless, ANAE has developed a broad methodology for the spreading of vetiver use.

Research for Stock Multiplication

This activity is under the responsibility of ANAE, which carries out and organizes research at village level to identify places where vetiver can be reproduced in the first phase of spreading use. Costs at this stage are generally manpower for plant collection, transport to the multiplication area and labour for preparation and planting in nurseries.

Identification of Groups Capable of Fast and Increased Production

Rural groups with work to do are the first to be concerned in this. They must multiply vetiver for their use, then sell to other projects. As it is crucial to leave this task to motivated farmers, the choice of groups is assured by the regional branches in their own areas. Regional branches are in direct contact with the nursery planting site, looking at the availability of water, security, the nature of the soil,

farmers' commitment, the importance of soil conservation action necessary in a region, positive perception by the local communities. Nevertheless, we must acknowledge individual initiatives in creating vetiver nurseries. ANAE encourages these activities.

Multiplication

Multiplication is the most important aspect of spreading vetiver use. ANAE adopts numerous methods, individual effort for multiplication, by groups of people or by whole communities. ANAE has always bought vetiver for the projects it finances. This is justified by a strong commitment to have vetiver produced by farmers, in work time, production sites and maintenance.

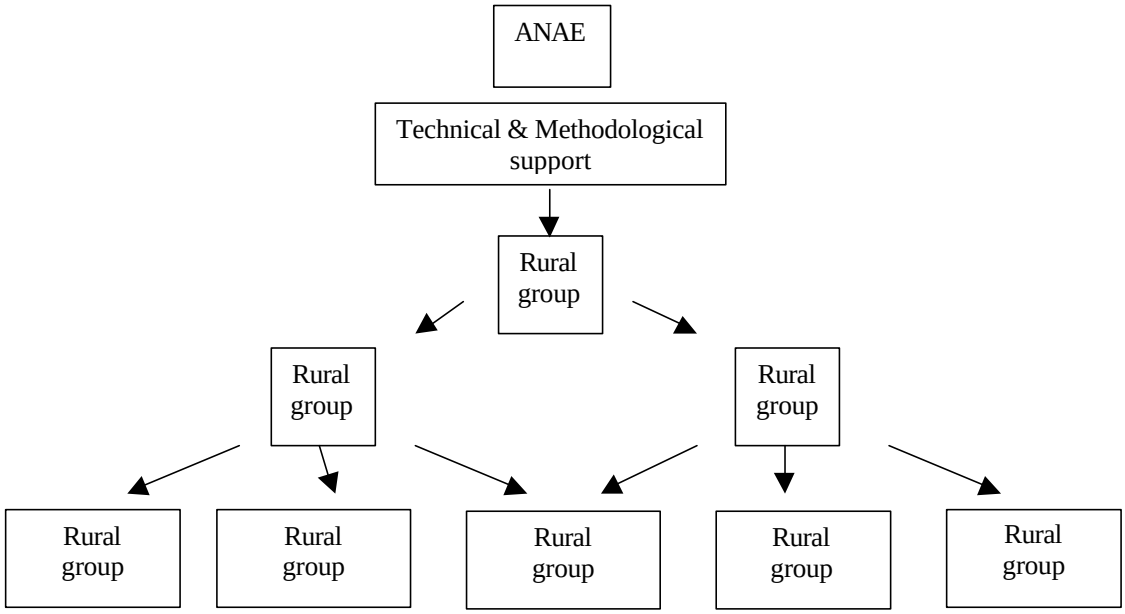

Fig. 3. Horizontal transfer of techniques

Application in Projects

The use of vetiver has currently been diversified in the rural context. Vetiver is mainly used to fix unstable soils; then, according to regional contexts, it is used as mulch for agricultural plots, as compost, as straw bed, in crafts and in the production of biomass fuel.

Anti-erosion barriers: The use of vetiver as an anti-erosion barrier on the hillsides is one of the association's most important activities. This type of project receives priority support from ANAE. Activities begin with progressive planting of barriers. ANAE supplies farmers with the vetiver they need to plant along the contour level, fairly widely spaced to encourage the rapid development of the plants. These lines are heavily fertilized by compost. Then the farmers are left to gradually fill in the spaces and other contour levels. At the same time, farmers must also set up production nurseries. For example, there is a village called Betela in the west of Madagascar, in a semi-arid area at 500 m elevation, with 1000 mm of rainfall a year on loamy soil. In one rainy season, trapped sediments reached 20 cm behind the barriers. In this example, 5 ha of hillside had to be protected by 3 100 m of vetiver contour and 8 ha of low-level fields safeguarded for rice and vegetable production. On this site, the average tillering of a stool of vetiver is 56. The project started in 1994 with a US$400 grant; in 1995 US$185 was granted. By then, 650 m of vetiver had been planted. From 1996, farmers continued their work without the need for financial help. Today, this village of one of the best producers of vetiver for ANAE. They planted 3 100 m of vetiver after four years of work.

In some places, vetiver has become recognized as a miracle soil-conservation plant whose use and production has become part of community rules. But the real reason for its adoption is that it is easy to plant and maintain as a border for agricultural holdings and family plots.

Vetiver is often used in conjunction with other plants in anti-erosion barriers. It is generally associated with leguminous varieties such as *Tephrosia* spp., *Crotalaria* spp., *Calliandra* spp., which are also used for fertilizing and as animal fodder.

Protection of banks: Malagasy soils, of a deep ferralitic, loamy and alluvial nature, are characterized by their fragility, and vetiver has begun to show farmers and most importantly policymakers of its capacity to develop even in the most difficult conditions. In the protection of steep banks, it can be used on its own or in association with other plants. Where the area to be conserved was large, it has been combined with *Phragmites communis*, a reed which lives along the watercourses and can resist flooding. Alternative lines of phragmite and vetiver have proved to be successful in controlling floods or a rise in water level. For the edges of irrigation channels, techniques for fixing fragile soil on sloping land have not yet been entirely mastered. In effect, work is carried out in the dry season, which makes planting difficult, while the rainy season is characterized by its intensity and short duration.

For more important large-scale infrastructure works such as gabions, vetiver is planted in a line around them to deal with undermining or hollowing by water.

Protection of infrastructure: The protection of tracks is a big problem because the need of vegetative cover is so great. Also, the method adopted is to organize the people who use the tracks into different groups. Each group is responsible for a portion of the track. ANAE supplies them with vetiver for conservation and for nursery setup, covering the parts most susceptible to erosion. For bridges, vetiver is planted at the entrance and exit by users.

Other uses: The development of direct seeding techniques has led to an urgent need of vegetative matter for covering the soil. As straw mulch is no longer sufficient, available materials are those produced by anti-erosion barriers and the waste of production crops, and it is normal to find cuttings of vetiver used to cover the earth.

The popularization of improved housing and alternative fuels has also led to a growing interest in vetiver leaves. They can be used in fuel production with a clay base, together with cow dung and vegetative waste.

Other uses as in crafts are still at the setup phase. Farmers in Ankazomiriotra, in the mid-west, have started to make hats, mats and baskets out of vetiver.

Conclusion

Despite the lack of information and research, the use of vetiver is beginning to spread in the countryside. Once farmers see the results of the work led by ANAE, even on a small scale, they are easy to convince. It is not uncommon to experience criticism from the other technical and political organizations on the risks incurred from investing in the use of vetiver as a protective measure. In fact, teaching in Madagascar, which is based on the French system, overlooks simple organic techniques, other successful experiments and research done locally or by other countries.

ANAE is now fully at the spreading stage. If we refer to Fig. 4 below, it shows that adoption and use of vetiver increases every year. The main limiting factor of this growth is the lack of vetiver stocks.

From four in 1994, the number of villages using vetiver has grown to 106 in 1998. This number will double during the 1999-2000 campaign, as nurseries and production sites are in place. It must be emphasized that the classic small project is to do with soil conservation action, such as reforestation, management of slopes, applying minimal soil tillage techniques, fertility management, etc.

The use of vetiver is still at the experimental stage. The present context amplifies and spreads agricultural production problems with an alarming destruction of the physical environment. One of Madagascar's biggest challenges is to slow down and control soil degradation by introducing locally adapted practical and technical solutions which will conserve the environment as well as being

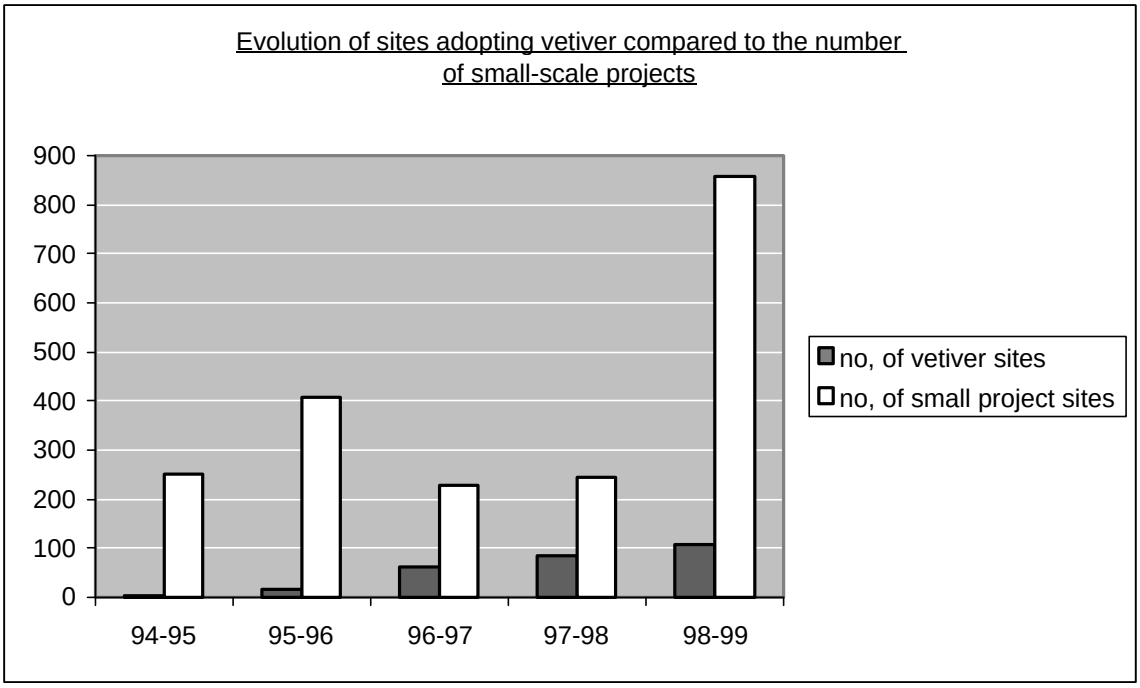

Fig. 4. Evolution of the adoption and use of vetiver on small project sites

manageable and profitable for small family holdings. At the same time the problem of land ownership rights, one of the most important aspects of development, turns out to be one of the causes that delay the wide and rapid spreading of soil conservation techniques. The long-term solutions to the management of natural resources thus rest in the hands of the policymakers, and the efforts of farmers in the projects have no meaning unless all farmers take on the same measures. In the context of rural development, we ask much of farmers in terms of mental and physical efforts (problem identification, finding solutions, realization, financial participation, follow-up, evaluation, etc.). Without undermining its responsibilities, it seems that the expected and dedicated role of the state is lacking in many respects.

Nevertheless, despite the shortfalls shown in the rural context, small projects try to evolve at the farmers' own pace, bringing their contribution to problems relating to the sustainability of natural resources. One of the challenges for ANAE is thus to contribute in controlling, indeed in slowing down the process of soil degradation by erosion. Simple technical solutions have been tried and tested and small projects try, in their own capacity, to encourage the greatest number of people to use anti-erosion techniques. It has to do with making the means of self-organization available to the population so that they can manage their own lands with close awareness of their own environments.

Vetiver is showing to be a way of solving these problems. Applications for collaboration on its use are many. The initial work led by ANAE has shown its protective capacity and the profitability of its use. This is why the Research Centre in Madagascar has a lot of work to do in the coming years.

The ultimate outcome would be to make it second nature for farmers to use and produce vetiver for all sorts of soil-protective actions.