

## CHAPTER 5

# SOCIO-ECONOMIC IMPACT

## VETIVER SYSTEMS FOR COMMUNITY DEVELOPMENT AND POVERTY ALLEVIATION IN INDONESIA

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### ABSTRACT:

Around half of the estimated 230 million people of Indonesia's archipelago of more than 17,000 islands live in rural areas, dependant on agriculture for their livelihoods. A good number dwell on arid, steeply sloping volcanic mountain slopes. Often there are no rivers or irrigation canals, and the inhabitants rely primarily on key dry land crops such as cassava (tapioca) and corn as their staple. Anti-monsoon rains and strong winds cause steady erosion of the heavily weathered terrain and prevent topsoil development, resulting in much of the eroded land ending up in the ocean and/or rivers, frequently mixed with pollution, and degrading key resources. Landslides are common, often causing loss of life, homes, planted farmlands or worse.

East Bali Poverty Project (EBPP) introduced vetiver systems (VS) in 2000 to the most isolated and impoverished region of Bali where 19 scattered communities had never seen the outside world, to facilitate first-time, all weather access roads through steep and sandy volcanic mountain terrain, giving choices for the future that their ancestors had never known.

The new roads have enabled thousands of families to visit well-stocked markets to supplement their root crop diets with fish and vegetables; visit health centres for the first time and ensure pregnant mothers and babies received appropriate medical care; interact with other communities previously regarded as foreigners; and, most important of all, enable EBPP to develop schools to educate the children – the first generation in the history of this region to become literate.

Integrated school curricula, designed on a needs basis, included all the properties of vetiver, from terracing steep mountain slopes for organic vegetable and herb school gardens, creative handicraft classes with roots and grass, illustrating in paintings, model development to developing business cooperatives to sell vetiver handicrafts.

Economies started to develop as illiterate farmers, whose key source of income was the sale of one cow after a 10km mountain walk, now invested in communal pick-ups to transport their own cows to market, re-investing the revenue in new calves and Vetiver grass soon became the preferred cow fodder, especially in the long dry seasons.

Children's success with their school gardens encouraged parents to start planting vetiver nurseries and rapidly convert cassava and corn fields on steep and arid mountain slopes into lush organic vegetable and herb gardens, providing daily nutrition for previously malnourished children and enabling a surplus to be sold in the newly accessed markets.

Community cooperatives are now developing to sell vetiver slips commercially from well established mountain nurseries. Vetiver's bio-engineering properties have transformed village infrastructure enabling schools, clinics, roads and water resources development. Abject poverty and

despair for all villagers before they embraced vetiver systems, are now being overcome to provide a future of hope and sustainable social and economic development, the key benchmark of progress.

Successful dissemination of these wide ranging VS applications and promotion of comprehensive VS hands-on field training courses has resulted in a steady expansion of successful vetiver projects being implemented throughout Indonesia for the private and public sectors. Some key applications will be covered in this paper.

**Keywords:** access, poverty, children, nutrition, healthcare, education, sustainable development

## 1 INTRODUCTION

Over half of all Indonesians live in rural areas with their livelihoods dependent upon agriculture. In the vast highland regions (approximately 79 million hectares) spread across much of the archipelago, difficult conditions of poor soil and limited access to water, force villagers into a daily struggle to earn a living from their land. Some of the poorest rural communities live in mountainous regions cut off from access to public services such as schools and health clinics, development programs or innovative ideas to improve their lives. Although the people may have adapted to the challenges of their environment, they often lack the skills to make optimal use of their available resources. They struggle as subsistence farmers growing mainly corn and cassava on steep slopes of dry, sandy soil where erosion and the danger of landslides are inevitable with each rainy season. Their families suffer from serious health problems from limited diets and poor hygiene due to difficulty in accessing clean water. Separated from government schools by kilometres of rough terrain, the children have no access to education and the possible means to change their conditions.

Area development programs to build infrastructure and provide public services, even at the regional level in Indonesia, remain highly centralized. Villages in difficult to access areas are basically forgotten. Although the people of such regions may be the most in need, they are not a priority in development planning as implementation of programs would require too great an investment of energy and funds. Poverty alleviation and development programs implemented by government agencies or international NGOs also tend to be partial in scope provided in the form of handouts which do not address the real needs of the communities. The people living in the region are not involved in the implementation and do not gain the capacity to understand the change such programs may introduce. Development programs fail when people have not learned to help themselves, and when they cannot accept, let alone sustain, new ideas and methods.

This paper documents the positive transformation of the most impoverished area of Bali, a remote village of 15,000 people, in 19 isolated sub villages scattered over 7,200 hectares of the steep and arid east and north eastern slopes of Bali's two highest mountains, Agung and Abang.

Virtually forgotten by time and progress, lack of access to the outside world and limited hamlet to hamlet communication meant life had hardly changed since ancestral times. A simple grass called vetiver (*Chrysopogon Zizanioides*) was the key tool of change from its introduction by EBPP in March 2000: a transformation from detached acceptance of continued poverty to excited community participation to initiate positive change for theirs and future generations.

## 2 BACKGROUND

Ekoturin Foundation's East Bali Poverty Project (EBPP) was established in 1998 as a non-profit organisation, with the specific goals of reducing poverty and promoting culturally sensitive sustainable social economic development, prioritizing children, in Desa Ban, the most impoverished and isolated mountain village in Bali.

Vetiver was introduced to the project in March 2000 as the only practical and sustainable solution to ensure the stability of a newly cement-stabilised access road we had facilitated for thousands of families to get out of their village – a previously narrow and dangerous dirt track, via the saddle between the two mountains of Agung and Abang. Lack of any previous vehicular access meant that most government services could not get into the village and thousands of people from many mountain hamlets had *never* left their village. Without electricity, schools or any other form of communication, they were effectively cut off from the outside world, living as their ancestors: cassava and corn subsistence farmers with one or two cows, frequent sickness and high child mortality as the norm.

By 2005, Vetiver systems of conservation and stabilisation had become one of the many indispensably necessary elements in EBPP's comprehensive, holistic and integrated approach towards model sustainable social and economic development programmes for one of the most arid and impoverished regions of Indonesia, as documented in EBPP's 2006 paper, "Vetiver Improving Lives of Impoverished Indonesian Subsistence Farming Mountain Communities, Led by Children" (Booth & Adinata). By bringing profitability to the rural sector, the economy of the whole area benefited.

Vetiver's rapid acceptance by this impoverished community was a direct result of the close partnership established with the whole community at the outset and farmers seeing for themselves the benefits of the Vetiver System. The crucial first step was developing a mutual trust between all of the families of the 19 scattered hamlets that comprised the village *and* our small team of village volunteers in 1998, with David Booth's promises of "no money or rice – just your 100% commitment of motivation and participation in programmes that you choose that will lead your communities towards food security and sustainable social and economic development". The other key factor was that all projects initiated were at the request of the community, the key stakeholders, required their full effort and contribution of local materials where necessary, and ownership was theirs on completion.

### **3 INTRODUCING VETIVER BY DISSEMINATION AT VILLAGE LEVEL**

#### **3.1 Disseminating Vetiver benefits to isolated and illiterate farming communities**

Disseminating information in March 2000 to the widely spread communities in four different hamlets that they must *all participate* to plant a "foreign" grass to stabilise the verges if they wanted a road to the outside world, could only succeed as all previous communication: by word of mouth from EBPP field team, as every adult was illiterate.

Sensitively packaged *verbal* awareness information to leading community figures, building on the mutual trust established with all communities in 1998 soon ensured the communities' commitment to walk the 5-8 kilometres to plant a grass they had never heard of as (a) they needed the road that they had recently trekked the same distance to build and (b) they knew that the Elephant grass, Belu and Caliantra, which presently grew on their hillside land for cow fodder, were *not* effective in preventing soil erosion.

. *Children*, given the mandate by their parents to lead sustainable social and economic community development since the launch of EBPP's first integrated education programme in

September 1999 (“teach our children so that they can teach us as we cannot learn from outsiders”), directly led the community in planting the 80,000 road verge vetiver slips to form the necessary hedges. After being shown how to make the planting holes it only took two days to plant 3km of dirt road verges with vetiver, which ensured that no landslides ever closed this new access road.

The children’s motivation, pride and leadership set the stage for EBPP team to introduce all new vetiver initiatives to the children, who would lead the community forward, empowered with relevant and integrated education in EBPP schools.

EBPP’s stages of introducing the many *vetiver-powered* sustainable solutions to initiate community based poverty alleviation, with the key principles of “Helping Disadvantaged Children and Communities to Help Themselves”, shown in Table 1, “Vetiver Introduction, Dissemination and Extension to Rural Farming Communities and Schools in Bali from 2000 to 2006”.

Column 1 lists “Stages of Vetiver Systems Introduction for Poverty Alleviation”, with column 2 summarising community participation and acceptance, after “seeing by example” from their children and “learning by doing” for their future growth.

Vetiver’s rapid impact and sustainable benefits to this once forgotten mountain community, covering all aspects of their lives, are shown in Table 2, “Community Problems in 1998 and Vetiver Powered Solutions by 2007”, with all programmes now accepted as models for rural community development and replication by the local government and many foreign organisations.

### **3.2 Children Introduce Vetiver’s properties and benefits to illiterate parents**

Children’s successful model organic vegetable gardens and vetiver nurseries at all EBPP schools urged parents to request training by their children to start their own communal vegetable gardens and vetiver nurseries in each hamlet in 2002. In 2005, all parents “graduated” and then started their own vetiver-hedge-supported home vegetable gardens on steep plots near their homes, providing previously unobtainable family nutrition year-round *and* committed to transfer vetiver technology and slips to neighbours. (See Table 1).

### **3.3 Children explain Vetiver Systems to foreign donors and supporters**

EBPP’s donors and sponsors often visit projects they fund, whether education programmes, organic farming or others, and without exception, notice the vetiver hedges stabilizing the dirt roads leading to the various hamlets, yet none of them had ever heard of vetiver grass. Children then guide guests to their sustainable school gardens and explain the process of converting steep and arid land to lush vegetable gardens, stabilised with vetiver hedges as the first stage in newly cut terraces on previously steep and barren slopes. All donors see the sustainability provided by vetiver and are encouraged to continue supporting our programmes and disseminate vetiver information to others.

## **4 VETIVER FACILITATING ESSENTIAL COMMUNITY INFRASTRUCTURE**

### **4.1 Community based participatory approach**

Sustainable solutions initiated since 1999 in Desa Ban can be attributed mainly to the fact that all of EBPP field staff since the beginning are natives of the village, speak the local Balinese language and could empathise with the most isolated communities as they also faced the same problems. Hence this was a 100% community based programme: for the people, by the people.

With a target to initiate integrated and sustainable solutions to all of the key problems facing the communities, EBPP field team held daily dialogue with village elders, parents, farmers and even children to understand the perceptions and beliefs held by those in the higher mountain regions with the highest child mortality.

Vetiver, entering the lives of this extremely isolated and impoverished region of mountainous east Bali in 2000, was rapidly embraced by the population of over 2,500 families in 19 sub-villages as a multi-beneficial solution for many barriers to their development as documented in the 2003 paper “*Vetiver Grass: A Key to Sustainable Development on Bali*” (Booth, Adinata). It is only really in the last 2 years that the true effects of sustainable social and economic community developments are being clearly seen.

Starting with a simple school in 1999 with a relevant and integrated curriculum and a stabilised access track opened in March 2000, a better future was in sight for many.

**Table 1:** Vetiver Introduction, Dissemination and Extension to Rural Farming Communities and Schools in Bali from 2000 to 2006

Year	Stages of Vetiver Systems Introduction for Poverty Alleviation	Pilot Vetiver Dissemination to Impoverished dry-land Subsistence Farming Communities to Empower by seeing Vetiver's Benefits and Sustainable Development Potential	Development of Vetiver Dissemination and Training for farming communities and schools - "Learning by Doing"
2000	<b>Bio-engineering solution:</b> Stabilize steep road verges, giving first-time access for thousands of people to health centres, markets and potential economic development	(i) Establish mutual trust between EBPP & community; (ii) clarify differences between vetiver & known grasses; (iii) use culturally sensitive benefits-based approach in awareness and education programmes in group discussions, emphasising ownership through 100% community participation in planting; (iv) capacity building and empowerment to use vetiver for sustainable development and environmental improvement	1) Dissemination to <b>illiterate farmers</b> by sensitive " <b>for the people by the people</b> " vetiver field training, emphasising potential benefits for future generations. Included maintenance, monitoring and recording vetiver growth and benefits; 2) Vetiver training refreshed annually
2000-2001	<b>Seeing Vetiver grow:</b> Vetiver incorporated into village school curriculum & first pilot school organic vegetable garden and pilot handicrafts from roots	(i) Children plant vetiver slip in tall sand-filled pot outside school to see root growth and slip development, record weekly growth and learn vetiver properties and benefits for future development. <b>One</b> year's root growth of 2.2 meters used for crafts; (ii) Children plant first village vetiver hedges for school organic vegetable gardens on steep and arid volcanic land	1) EBPP trains and gives vetiver stock to Indonesian <b>Permaculture Foundation</b> (IDEP) to establish pilot permaculture projects for <b>Central Bali</b> farmers groups; 2) EBPP trains <b>South Bali school</b> in vetiver technology and handicraft making
2001-2006	<b>Preventing farm soil erosion:</b> Vetiver hedges support horizontal terraces for school organic vegetable gardens; vetiver roots and grass enter creative art, craft & roof thatching classes	(i) Parents " <b>see by example</b> " children's school gardens and are keen to learn and replicate on their land; (ii) children educate/train parents and establish family and community Vetiver nurseries; (iii) EBPP gives vetiver slips & training to Village Head who sees benefits and joins EBPP's commitment to disseminate village-wide for erosion control, arid farmland improvement and optimisation of all vetiver benefits	1) EBPP staff & children give Vetiver slips and training to 85 poor <b>North Bali School</b> children from deprived families on the school's steep and arid land; 2) Vetiver training & stock to poor <b>North Bali Coast village</b> for ocean protection & rehabilitating arid and eroded hill slopes
2002-2006	<b>Food security, led by children:</b> organic vegetable farming on steep and sandy land to replace cassava and corn as staple: improved health, food security and sustainable development	(i) Participatory community discussions using conceptual "before, during and after" sketches (based on children's school garden success) initiated <i>new</i> farmers' groups to learn organic farming for food security and eventual larger terraced organic vegetable farms by " <b>learning by doing</b> ", taught by their own children for the 1 <sup>st</sup> 6 months; (ii) local youths from all hamlets join EBPP's Vetiver Team as key trainers for farmers co-ops	1) EBPP gives vetiver to Bali's organic worm castings expert to include in her training for <b>W &amp; N Bali</b> farmers' groups; 2) 2005: <b>EBPP's Vetiver training video</b> produced, supplementing vetiver training and dissemination for farmer's groups, schools, universities, Government, etc.
2004-2006	<b>Preventing destruction of mountain spring safe water supplies for 1,300 families, prioritising young children</b>	Local community trained to plant vetiver to stabilize new soil fill after mountain spring water supply almost destroyed by torrential rains and also plant vetiver hedges to divert future flash floods. Daily maintenance and monitoring empowered community to accept full responsibility for future maintenance.	1) 2006: " <b>Vetiver Grass – A Hedge Against Erosion</b> " 1 <sup>st</sup> Indonesian version 2) 2006: <b>IDVN's 1<sup>st</sup> Vetiver Training workshop for Indonesian Government Forestry Rehabilitation specialists</b>

**Table 2:** Community Problems in 1998 and Vetiver Powered Solutions by 2007

No	Main Community Problems in 1998 Preventing Advancement or Change	Sustainable changes by December 2007, with Vetiver as the direct or indirect key
1	<b>No vehicular access in or out</b> from the south of this 7,200Ha village only steep, narrow and highly erosive mountain tracks. Very few owned motor cycles. 90% had never left the village. No access to health facilities or markets with good food supplies;	<b>Year round road access for 15,000 people:</b>  Over 27km of vetiver-protected dirt roads, many with parallel concrete tracks. including a 10km spine road through the village linking all hamlets and allowing unrestricted movement. Trucks, pick-ups and motor cycles now transport people, cattle, crops etc. to market, & mothers can take babies to health clinics.
2	<b>Illiteracy:</b> virtually all parents and almost 2,000 children illiterate due to no accessible schools or money to pay school costs.	<b>More than 800 children have been educated in EBPP's schools since 1999, built on vetiver stabilised volcanic slopes.</b> 127 have graduated elementary school and 35 from junior high school.
3	<b>Year round erosion and little arable or productive farmland:</b> Arid, rain fed volcanic ash, with average slopes of 40°. and many large tracts >60°.	<b>Thousands of metres of vetiver hedges planted</b> preventing hundreds of tons of soil erosion by stabilised hundreds of Ha of farmland.
4	<b>Diet not adequate:</b> The staple for most is cassava, sometimes mixed with corn and/or a little rice. Meat or fish were rarely in their diet. Diet lacks vitamins, minerals, protein and iodine;	<b>Nutritious vegetables are now available daily</b> from vetiver-enabled school, community and individual kitchen gardens as well as from the now accessible markets in and outside the village.
5	<b>Malnutrition &amp; micronutrient deficiency:</b> Up to 50% of infants malnourished; many children and adults had stunted growth.	<b>Malnourishment of children virtually eliminated</b> through (a) nutritious school meals for all EBPP schoolchildren, (b) iodine and vitamin A supplements given annually to all children and (c) nutritional supplements provided to all 1,400 infants in EBPP initiated <i>Posyandu</i> (mother/baby monthly health posts).
6	<b>Child mortality:</b> 25% before one year old (EBPP survey 2000-2001);	<b>Child mortality down to less than 1%</b> due to better access, knowledge, nutrition and safe water consumption.
7	<b>Iodine Deficiency Disorders (IDD): Palpable goitre in children aged 6-12: 84.5% shown by 1998 Government Health Department survey ( see above)</b>	<b>Only 20% of children had palpable goitre in August 2005</b> in Government Health Department survey – much lower than the national average.
8	<b>Safe Water Availability: NONE.</b> Either a 2-3 hour walk to get water from the few remote wells or springs, most highly contaminated	<b>As a result of vetiver stabilised mountain springs and access roads,</b> over 1,400 families now have safe water supply from

	with E-coli bacteria. A high % of child mortality due to consuming contaminated water.	remote springs piped to central community reservoirs. E-coli bacteria count in most cases is now zero.
9	<b>No Local Health facilities:</b> average walking time to <i>Puskesmas</i> (community health centre) is 5-6 hours BUT sick people rarely go because of the dangerously steep and narrow dirt-tracks. The nearest hospital was 55km away;	<b>Thanks to improved access roads facilitated by vetiver, EBPP established 27 Posyandu</b> in the 19 hamlets since 2003, trained local cadres and service these posts. 1,000 mothers and 1,400 infants now attend monthly and get all vaccinations, nutrition status checks and nutrition supplements.
10	<b>Very basic village market - no iodised salt, fish or nutritious vegetables sold, a root cause of malnutrition:</b> 4-5 hours one-way walk to the only market for the 15,000 population, at the bottom of the mountain, held every 3rd day from midnight till 8am.	<b>All of the 3,000+ families now use the vetiver stabilised all-weather tracks</b> to go weekly to their village market <i>and</i> to larger and better stocked markets in other village for vegetables, fish, eggs, iodised salt, hygiene items, etc.
11	<b>Cow Fodder scarce locally – requires 4-6km mountain trek:</b> The cow is each family's bank, a 2-3 year investment, which when sold provides funds to improve their simple dirt floored bamboo houses, buy clothing etc.	<b>Year round cow fodder now available at home from vetiver nurseries and vetiver hedges</b> bordering vegetable gardens since 2001. According to farmers, their cows prefer vetiver over other grass and vetiver is green and plentiful in the dry season.
12	<b>3,000+ hectares of land denuded by 1963 Mount Agung eruption - extensive erosion, soil loss &amp; ecosystem depletion.</b>	<b>Reforestation and carbon sequestration:</b> started in 2007 with bamboo, Neem & Moringa, facilitated by vetiver hedges to prevent erosion & loss of seedlings. Carbon offsets already committed by foreign supporters.
13	<b>Children have no future: destined to become cassava and corn farmers, as their parents and ancestors, with no choice or chance to change.</b>	<b>Hundreds of EBPP educated children empowered</b> with many skills to develop livelihoods & cooperatives in all aspects of VS for erosion control, nurseries, handicrafts and marketing; sustainable organic vegetables and herbs. <b>These children have choices for their future</b>

#### 4.2 Vetiver protected new roads give choices for thousands of people's futures

Vetiver, first introduced in 2000 to stabilize newly widened dirt roads to enable over 2,500 families to leave their village for the first time ever by vehicle, instead of on foot, has not only provided access to markets and health centres, but has also inspired many communities to buy communal pick-ups since early 2003. Every day now, pickups are seen, coming back from market fully laden or taking livestock to the main cattle market 100 kilometres away.

Many other visible signs of sustainable economic development in all of the 19 communities, re-investing the income they can now get from better cattle sales and crop prices, include:



- Trucks bringing building materials, to the previously most isolated hamlets that only had bamboo huts before, for building new 2-3 roomed houses, with ceramic tiled floors, sofa sets and proper tiled roofs;
- New motor cycles plying the safer and more accessible tracks;
- New Balinese temples with high quality places of worship, proudly adorned for new ceremonies where simple bamboo temples stood before;
- Young and old people alike venturing to the world outside their village for the first time, and being inspired to improve their lives with ever increasing knowledge; and
- Husbands taking their wives to hospitals and clinics to have their babies with professional help, instead of in their bamboo hut alone, when no midwives could access the village.

All of these newly empowered families now see a brighter future, thanks to just one access road, kept open through the heavy storms and flash floods, due to the power of vetiver systems!

### **4.3 Vetiver prevents destruction of essential mountain springs**

A remote mountain spring that EBPP had developed in 2003, providing almost 100,000 litres of water per day, the only safe water source for over 500 families in the hamlets below, was almost destroyed when raging flood waters gushed down the mountain and completely ripped out the side-slopes supporting the water channel in February 2004. This was only the second full rainy season since completing the spring was to be a serious test for the bio-engineering properties of vetiver.

A major concern when planning the vetiver rehabilitation during the dry season was that the roots may veer towards the spring in search of water during the dry season. To prevent this, the land was completely excavated at both sides of the 25 metre concrete water channel to a depth of one metre and lined with plastic sheeting before backfilling. Both banks of the spring channel were then stepped to further reduce the water flow velocity and over 10,000 vetiver slips planted in rows, zig-zag pattern 20 cm apart with slips at 10cm spacing along the rows. Local people watered the vetiver daily for the first month and ensured they kept their young vetiver shoots clear of competing weeds. Within 2 months, the vetiver was a rich green carpet, with roots extending down more than a metre.

The most important additional protective measure was to clear undergrowth from the steep mountain slopes above the spring and to guard against future torrents threatening the spring. Vetiver was planted diagonal lines in the steep valley above the spring to divert the flood waters towards a natural channel to the rear and west of the spring box that had formed after our vetiver protective diversionary works a year earlier.

Vetiver worked its miracle. After an even heavier and longer rainy season from November 2004 to May 2005 and many monsoon floods since that time, the mountain spring is very much intact, providing better flows than before and looking like a lush vetiver nursery. Regular tests with our Delagua portable laboratory verify that no contamination has leached into the channel, proven by a zero count for deadly E-coli bacteria. This delicious safe spring water is literally saving many babies lives every year, evidenced by the now zero child mortality rates.

### **4.4 Vetiver stabilises built-up volcanic ash for school construction**

All of EBPP's integrated education programmes started in the small community *bale banjar* (meeting centre) in the respective hamlets as soon as donors committed to covering the children's education costs. These were not very conducive to the children learning due to being open sided buildings and often needed for community meetings or religious ceremonies, thus disrupting classes.

When we could build a simple school, the community had to allocate land for the 150 sq. m. schools and recreation areas next to the school. The problem in all hamlets was that there was no level land! In each case, land had to be filled from cut hills, needing vetiver's bio-engineering solution to stabilise the compacted sand perimeters.

The most difficult location was the land for Cegi School, a rounded hill forming the access track leading to the children's school vegetable garden (described below). This location had been discounted by the community and even many of EBPP field team, as the whole foundation would comprise volcanic sand cut from the top of the hill to fill the area until the size needed was achieved. The power of vetiver, taking firm root within days surprised everybody – and sent a message through the whole village that any sandy ground can be stabilised with vetiver.

The school, completed in July 2004, still delights everyone with the permanent green carpet of vetiver surrounding the whole building, preventing any erosion and trapping blown debris of plastic or paper, keeping the surrounding hill-slopes very clean and attractive.

#### **4.5 Mountain homes made safer and greener with Vetiver**

Most families start life in a small single roomed house built from woven bamboo with a dirt floor, on a piece of land cut into their sloping hillside land. The plots are made quite large to allow for continuing erosion, generally protecting the perimeters with either elephant grass or *Caliandra* trees, watching each rainy season as the erosion cuts away the sand from under the roots. Life changed for hundreds of children and their families once they took planted vetiver around their homes. Ask any child what they like most about vetiver and, apart from the benefits in establishing organic vegetable gardens, all will talk about how vetiver has improved their home life by stabilising the land, beautifying the surrounds during the hot dry season when all other grass shrivels and dies, but most of all, how the *akar wangi* (fragrant roots) give a nice “perfume” to their home.

### **5 ORGANIC VEGETABLE GARDENS AND VETIVER NURSERIES PROLIFERATE**

#### **5.1 Establishing organic school gardens and nurseries on barren, volcanic ash slopes**

Success with the Vetiver trials for road stabilisation in 2000 encouraged us to establish vetiver nurseries in all hamlets benefiting from EBPP education programmes, initially for creating organic school gardens. The communities in those hamlets provided steep and unproductive plots of land near to the children's schools for nurseries and school gardens. The aim was to illustrate how steeply sloping barren land could be transformed to fertile terraces, once Vetiver was established. By late March 2001, Cegi nursery was ready to be harvested and the children were the first to establish their 400 square meter school garden, carefully cutting one-and-a-half meter wide terraces on the barren 20 degree slopes. Double rows of Vetiver in zig-zag pattern were carefully planted 15-30 cm. back from the terrace face, putting aside the cut roots and grass in preparation for their handicraft classes. The Cegi nursery has continued to flourish, providing ample planting stock for the terraces of the 700 square meter community garden established in February 2003.

#### **5.2 Children's new school garden in Cegi becomes example for sustainability**

The success of the Cegi school garden from 2001, growing 20 types of vegetables, sowed seeds of enthusiasm in the community to such an extent that they requested the garden be handed back and provided another location, this time with more almost 40 degree slope. The experienced children rapidly prepared their new garden, this time using simple bamboo strip as initial borders to contain the soil, planting Vetiver around the perimeter. When the bamboo rotted, Vetiver was firmly established to contain the soil and provide a ready source of mulch once seedlings had been planted.

Now firmly established as the model organic garden in the village, complete with worm farms, nursery and rainwater collection reservoirs it is the first vegetable garden in the region with a year-round supply of nutritious vegetable. The garden became the training centre for other programmes and the many outside groups that we have trained, from local and international NGO's, Indonesian Government Departments and regional farmers groups.

### **5.3 Diets Improve as Organic Vegetable Kitchen Gardens Flourish**

Diets have significantly changed since hundreds of families learnt about the many vegetables that could grow on steep mountain slopes that could only host cassava and corn before. These families have also learnt the dangers of too much cassava, not enough iodised salt and the lack of vitamins and minerals in their diet.

Fresh vegetables are now eaten daily by over 600 families that only 6 years ago had never even seen a carrot, tomato or a potato. If none are available from their garden, they go to the distant markets in their pickup trucks or on motor cycles to ensure that the family is well fed.

### **5.4 Community Vetiver Nurseries**

The first community Vetiver nurseries were established in 2002 in four separate hamlets, two on Mount Agung and two on Mount Abang at elevations around 1,100 metres above sea level. Local unemployed young men became the guardians of the nurseries, with a brief to tell everybody in their communities of the benefits and for all of the farmers to see for themselves. In conjunction with EBPP schools in all of these hamlets, vetiver was soon “disappearing” from the nurseries to start trial gardens, stabilise homes and, in many cases, to eventually get enough vetiver roots to introduce the root perfume to their smoke filled, single roomed homes.

There are now dozens, maybe hundreds of vetiver nurseries throughout the village now, and since 2003, almost two million vetiver slips have been transplanted to community learning gardens, expanded school gardens, family kitchen gardens mountain reforestation programmes etc.

## **6 CONCLUSION**

The power of Vetiver systems, employing all its wide ranging applications from soil and water conservation and bio-engineering, have been the single most important factor in enabling EBPP to initiate successful and sustainable community development programmes in this previously isolated and most disadvantaged region of Bali. Sensitive approaches have ensured full community motivation and participation in solving acute problems for life's basic needs of safety at home, improved access to essential health facilities for the whole community, especially babies and infants, improved hygiene through plentiful and safe water supplies, food security through home grown nutrition and, most important of all, access to the outside world and the promise of a better future for present and future generations.