

TECHNICAL REPORT

The Economic Impact of Cluster Initiatives Under the Competitiveness Initiative Project

Interim Assessment and Recommendations



SUBMITTED TO
USAID

SUBMITTED BY
Bruce Bolnick
Nathan Associates Inc.

UNDER CONTRACT NO.
PCE-I-828-98-00016-00
Task Order 828

November 2003

Contents

1. Introduction	1
2. Methodology	1
3. The Economic Impact of TCI Cluster Initiatives	3
A. Quantifiable Economic Impacts	3
B. Other Probable Benefits	9
C. Other Possible Benefits	10
4. Pulling It Together: The Benefit-Cost Test	11
5. Additional Economic Benefits of TCI	13
6. Recommendations on Monitoring Economic Impact	15
7. Summary and Conclusions	17
Results	17
Patterns	18
Supporting Conditions	18
Role of the Project	19
Annex. Technical Notes	

1. Introduction

The Competitiveness Initiative (TCI) project began organizing industry clusters and developing strategies in Sri Lanka at the end of 1999. This was a novel approach to private sector development. Subsequently, USAID competitiveness and private sector development projects in several other countries have pursued the cluster concept. Despite its popularity, the approach remains controversial. Even today, there is not much evidence on the *economic impact* of cluster initiatives as a form of aid intervention to promote economic development. As Michael Porter recently wrote, “we have surprisingly little systematic knowledge of these initiatives, their structure, and their outcomes.”¹

In the design of TCI and the “Intermediate Results” indicators that have been used to monitor project performance, the focus has been on process-level criteria rather than the economic impacts. Nonetheless, at this point USAID is rightly asking hard questions about the economic impact of these cluster initiatives. Looking beyond the *processes*, have the cluster initiatives delivered substantial benefits for the economy of Sri Lanka? Are the benefits sufficient to justify the use of foreign assistance resources for this purpose? Are particular types of cluster activities especially successful, suggesting lessons to improve the design of other competitiveness projects?

The purpose of this report is to provide USAID/Colombo with answers to these questions by assessing the economic impact of initiatives undertaken by the eight cluster groups that have been organized and supported by TCI.²

¹ From Porter’s Foreword to Solvell, Lindqvist and Ketels, *The Competitiveness Initiative Greenbook*, Gothenburg University, September 2003, p.5. This volume reports results of survey evidence on 238 clusters worldwide. Even with the survey results – again quoting Porter – “data limitations preclude definitive findings regarding the performance of cluster initiatives.”

² The cluster groups are: rubber; tea; tourism; spices; gems and jewelry; coir; ceramics; and ICT. The present analysis is based on information compiled during field work in Colombo from November 17 – November 28, 2003. The analysis also draws heavily on Andrew Warner and Maureen Harrington, *Monitoring and Evaluation Report: The Competitiveness Initiative*, J. E. Austin Associates, April 2003; hereinafter referred to as Warner and Harrington (2003).

2. Methodology

The concept of “economic impact” used here is based on the standard methodology for an economic evaluation of development projects. In essence, the impact is defined as the *expected net present value (NPV) of additional incomes* generated directly by the TCI cluster initiatives. (For details see the Annex.) The analysis focuses on impacts that satisfy three screening criteria:³

1. **Highly probable.** The analysis only covers activities that are at an advanced stage of planning and have a high probability ($> .75$) of being implemented within 12-24 months. To the extent that implementation is uncertain, the benefits are discounted by the probability of realization.
2. **Attributable.** A key objective of the field interviews has been to determine the extent to which TCI clusters played a critical role in producing the economic benefits or accelerating the realization of benefits. The analysis excludes activities that likely would have been pursued anyway through other channels. In addition, the impact estimates are discounted for the *possibility* that similar outcomes may have arisen without TCI support, even if there is no evidence to suggest that this was likely.
3. **Quantifiable.** The analysis covers only activities where there is a sound basis for calculating the impact, based on information from cluster coordinators and cluster members, strategy documents, road maps, business plans, feasibility studies, and data compiled by Warner and Harrington (2003).⁴ If an impact estimate would require a host of suppositions, it is excluded from the benefit analysis.

The methodology unavoidably involves a mixture of measurement and judgment. As far as possible, the judgments err on the conservative side. Also, the analysis is limited to direct effects for the industry in question; inter-industry linkages and multiplier effects are excluded. In addition, the analysis is static; thus, there is no attempt to estimate dynamic

³ Actually, four criteria. The analysis also excludes activities for which the economic impact would appear to be of minor importance.

⁴ Due to tight time constraints, the assignment did not include independent compilation of primary data. The figures compiled by Warner and Harrington (2003) were re-checked wherever possible, and in many cases altered on the basis of more recent information.

benefits that may arise as investors and producers respond to higher profit margins or new market opportunities. All of these restrictions ensure that the estimates represent a *lower bound* on the net economic impact of TCI cluster initiatives.

The resulting impact estimate is then set against the cost of USAID support, giving a *benefit-cost ratio* for the overall *portfolio* of TCI cluster initiatives – or rather, a *lower bound* benefit-cost ratio, in terms of impacts that can be quantified at this time. It is important to emphasize the portfolio concept here. Like a venture capital operation, the expectation is that some initiatives will be big winners, some will yield moderate or low returns, and some will yield nothing. This is exactly what happened under TCI. While it is easy to pinpoint the “best investments” after the fact, one cannot predict at the beginning of a project like this which clusters or activities will produce large benefits. Under these circumstances, investment in a diversified set of cluster initiatives is the best strategy for maximizing return relative to risk.

3. The Economic Impact of TCI Cluster Initiatives

From field interviews and a review of TCI documents, 14 major cluster activities appear to have a high probability of realization, clear attribution to TCI, and potentially quantifiable. Data constraints reduced to eight the number evaluated in detail for this report⁵

Section A reviews the four most important initiatives in terms of economic impact. Each has an NPV of additional incomes exceeding \$1 million. These are: opening a new region to rubber plantations (Moneragala); upgrading the quality of crepe rubber exports (Lankaprene); upgrading the quality of gemstone exports (GemLab); and joint negotiation on energy procurements by the ceramics cluster. Four other cases fall below the \$1 million mark, and are discussed more briefly: the Ecolodge; the tea color separator; coir certification for the US market; and the sapphire branding initiative. Section B summarizes six cluster initiatives that are highly probable and clearly attributable to TCI, but for which data are not sufficient to estimate the economic impact. Finally, section C cites 10 other activities, at various stages of development, which have the potential to add substantially to the ultimate economic impact of the program.

A. Quantifiable Economic Impacts

1. EXPANDING NATURAL RUBBER SUPPLIES (MONERAGALA PROGRAM)

One major initiative of the rubber cluster is a program to expand production of natural rubber by opening a large area in Moneragala, the most impoverished region in the country.⁶ The program is motivated by the fact that rubber production in Sri Lanka has declined from over

⁵ Time constraints necessitated some methodological shortcuts, which are explained in the Annex.

⁶ "Connecting to Growth: Sri Lanka's Poverty Reduction Strategy," Part II of Government of Sri Lanka, *Regaining Sri Lanka: Vision and Strategy for Accelerating Development*, December 2002.

156,000 metric tons in the late 1970s to around 86,000 mt in 2001, and new land is not available in the main growing areas. At the same time, a competitive rubber manufacturing industry has emerged. Faced with declining domestic supplies, manufacturers have considered moving operations overseas or relying on imported raw materials. Only after the rubber cluster was organized through TCI did the industry consider upstream investment in rubber production to ensure domestic supplies.

The Moneragala region is well suited for rubber, but there has been no major investment there due to the remote location and earlier civil disorder. The new program aims to establish 40,000 hectares of plantings over a ten-year period. This will increase rubber production by 78,000 mt, or more than \$70 million per year. The program will directly create jobs for 77,000 people in plantations and factories. The required investment of \$100 million is to be financed on a commercial basis by major investors. The government has a critical role in allocating state land for the plantations, implementing the southern highway and Hambantota port projects, underwriting rubber research, and supporting smallholder cultivation. Although the financing is not locked in, several industry leaders are committed to realizing the investment. According to the TCI feasibility study, the real rate of return is between 19% and 36%, depending on intercropping.⁷ So the investment is fundamentally viable. The main uncertainty is whether the government will approve the lease of land. In a recent meeting, however, the Minister of Lands indicated that he will indeed approve the industry's proposal.

This program is fully attributable to work of the rubber cluster and technical assistance through TCI. Indeed, there is good reason to believe that collaborative approach was essential. Opening a remote region would be difficult for any single investor, due to infrastructure costs. Also, cluster support gave industry a strong hand in obtaining land. Even so, given the declining trend in rubber production and firming of rubber prices, a comparable program might have emerged before too long through other channels.

The benefit calculation here assumes 2,000 hectares of planting per year, and financial projections from the feasibility study. On this basis the program yields an estimated NPV of net additional income (capital and labor) of \$120 million. This figure must be adjusted for uncertainty about implementation, and the possibility that a comparable program could have emerged without TCI. This done by discounting the benefits 20% and attributing only the first five years of plantings to TCI. With these adjustments, the NPV of net additional income from the Moneragala program is still \$37 million.

2. UPGRADING CREPE RUBBER EXPORTS (LANKAPRENE).

The rubber cluster has pursued a program to upgrade the quality of crepe rubber exports, and forge new links with customers in the United States for the higher grade product (called

⁷ The feasibility analysis includes projections for intercropping with sugar, pepper and bananas.

Lankaprene). An initial order has been received at a price of \$2.00 per kg, which is \$0.80 better than the prevailing price for traditional crepe. The market is virtually assured, since the main competition, synthetic crepe, sells for \$3-4 per kg. Since capital costs and operating costs for the upgrade are low, most crepe factories are likely to convert to the new process. Within two years, Lankaprene production should reach 20,000 kg, generating US\$16 million in additional export earnings.

The Lankaprene story is entirely an outcome of the rubber cluster. The concept emerged from cluster discussions about rubber sector strategy, and has been carried through with a strong impetus from TCI in the form of technical assistance and a trip to Akron to meet potential customers. No similar development was under consideration through other channels. Even so, Lankaprene is so profitable that one cannot rule out the possibility that major players may have pursued this innovation at their own expense, or through other channels. The Cluster Chair acknowledged this, but emphasized that without TCI “it would have taken many more years, at best.”⁸

To quantify the economic impact of this initiative, the analysis uses conservative assumptions about the volume of Lankaprene exports, and limits the benefits to five years on grounds that a comparable innovation may arise over that time frame through other channels, in response to the profit opportunity. This gives an estimated NPV of additional net earnings of US\$31 million. Discounting (by 10%) for uncertainty about the supply response, one arrives at an adjusted NPV of \$28 million.

The benefits may extend beyond crepe producers if the enhancement of value at the processing stage stimulates demand for natural rubber. Presently, crepe producers rely on latex from their own plantations. Some processors are now likely to seek other sources of supply. The added competition will increase latex prices and benefit rubber producers generally, including smallholders. In the long run, higher profit margins should also stimulate investment in crepe processing facilities and rubber plantations.

3. UPGRADING GEMSTONE QUALITY (GEMLAB)

In 2002, Sri Lanka exported \$86 million worth of gems, excluding diamonds. To enhance the value of these exports, one major initiative of the Gem & Jewelry (G&J) cluster is to establish a fully accredited laboratory in Sri Lanka to certify the value, quality and origin of gemstones. This process can add 10% or more to the value of the stones.⁹ Currently, certification is done by sending gems to expensive overseas labs by courier or at international trade shows. Due to the high costs, only a small fraction of the exports are certified. The GemLab business plan, conducted through TCI, indicates that a local facility equipped to international standards

⁸ Interview, November 20, 2003.

⁹ Warner and Harrington (2003).

could process the stones at a cost of \$70. At this price the process would pay off for about 25% of the exports (by value) now sold without certification. If all of the suitable stones were certified, the value of gemstone exports would rise by nearly \$2 million per year.¹⁰ In addition, the lab will allow gem traders to reduce working capital costs, which are a large component of the cost structure, because certified gems sell more quickly. This initiative is totally attributable to the G&J cluster and technical support provided by TCI.

A pool of \$750,000 has been earmarked for this investment, including \$350,000 from a 0.25% cess on gem exports (introduced at the industry's request) and \$400,000 from the 2003 budget. The industry must still obtain Ministerial approval, arrange the release of funds, and get the lab incorporated. The likely opening is early 2005.

Using conservative assumptions about the utilization rate for the GemLab and cost estimates from the business plan, the NPV of additional incomes from the enhancement of gemstone value amount to \$3 million. (The reduction in the cost of working capital is not included in this estimate.) The uncertainty of implementation must also be taken into account. For present purposes, the probability of implementation is estimated at 75%. This gives an adjusted NPV of \$2.2 million.

4. ENERGY COST SAVINGS FOR THE CERAMICS INDUSTRY

Just one cluster initiative has resulted in a "quick win" – a reduction in energy costs for the Ceramics Cluster. After a strategic analysis of the supply chain, the cluster jointly negotiated a 5% volume rebate on purchases of LPG from Shell Gas. The full rebate applied to companies purchasing at least 150 tons of gas per month, with lower discounts for smaller customers. Shell also agreed to a transparent pricing formula, assuring the industry that subsequent price adjustments would reflect market conditions, not monopoly power. Soon thereafter a local company was licensed to compete with Shell. The cluster took this opportunity to obtain another 7.5% discount from Shell.

Warner and Harrington (2003) estimate that energy costs account, on average, for 10% of the supply price of ceramic exports, which totaled \$42 million in 2002. Based on these figures, the industry is saving just over \$500,000 per year on energy costs due to the LPG discounts. The NPV of the cost saving, over a five year period, is \$1.8 million.

The initial rebate was fully a cluster outcome. The second discount, however, was sparked by the entry of a competing supplier. The larger companies could probably have obtained at least some of this benefit on their own. Thus, the impact analysis here assumes that 100% of the

¹⁰ For details see the Annex. The figures are derived from data in the Ceylon Gem Testing Center Business Plan (2003).

initial rebate is a TCI benefit, but only 50% of the second one. With this adjustment, the NPV of the cost savings is \$1.2 million.

Two important qualifications apply to this estimate. First, after negotiating the volume rebate for the ceramics cluster, Shell extended the same deal to its other bulk purchasers. Thus, the overall benefit to the economy was a multiple of the gain to the cluster itself. However, the benefit of the price reduction is essentially a transfer from the LPG supplier to the customers, not a real resource saving or efficiency gain. Since the government owns just over half Shell, a corresponding share of the gain to customers is a loss to the Treasury.

5. OTHER QUANTIFIABLE IMPACTS

Four other TCI cluster activities satisfied the screening criteria but yielded smaller quantifiable benefits.

Ecolodge

One highlight of the strategic plan for the Tourism Cluster is an effort to develop eco-tourism as a new product to broaden the market and increase expenditure per tourist. To test this potentially important market and establish best practices for further developments, six members of the cluster have committed \$900,000 to finance an Ecolodge abutting the Sinharaja Biosphere Reserve. The total project investment is estimated at \$1.6 million, including \$300,000 for the value of land conveyed by the tea plantation where the lodge is to be built. The balance, if necessary, will be financed by a loan. In addition, USAID/AEP has agreed to leverage the private investment with a \$900,000 grant for research that will be conducted in conjunction with the Ecolodge. This project is entirely attributable to the cluster initiative and technical assistance provided by TCI. Based on the feasibility study for the lodge, the estimated NPV of the economic benefits (income to capital and labor) is \$680,000. Discounting this by 20% for uncertainty about implementation, the estimated NPV is \$540,000.

Upgrading the Market for Coir

With TCI support, the Coir Cluster is getting Sri Lankan coir fiber and products tested in Europe and American laboratories to certify the properties of coir. Tests in Europe have been completed. The objective is to penetrate markets for industrial applications such as biodegradable padding for automobiles. Testing in the United States will take place early next year. After its characteristics have been certified, Lankan coir can be listed in specification books as an approved material for erosion control matting in road and transport projects in various states. As a result, low-value fiber exports to China will be diverted to higher-value exports of coir fiber and mats to the United States. This development is unambiguously attributable to the cluster and supporting technical assistance through TCI. Looking only at

the U.S. market, for which volume and value estimates could be obtained, the initiative is expected to enhance the NPV of incomes for Sri Lankan producers by \$630,000. Discounting this by 20% for the fact that implementation is not yet a certainty, the adjusted impact is \$500,000.

Tea Color Separator

The Tea Cluster has been working with the University of Moratuwa to develop a local color separation technology, which can be used to upgrade the quality of tea supplied to the auction. Presently, the only available color separators are imported, at a cost of about Rs 10 million, which limits their use. The target price for the locally produced separator is Rs 2 million. At this price, the industry is expected to absorb 250 additional machines over a five year period. Each one will process an estimated 2000 kg of tea leaves per day, adding approximately Rs 6 per kg to the value of the crop. The NPV of the additional income is Rs 25 million, or \$250,000. This economic impact is fully attributable to the cluster initiative. Discounting the result by 25% for uncertainty about implementation, the adjusted net benefit is just under \$200,000.

Ceylon Sapphire Branding

Eight members of the Gem & Jewelry cluster (so far) have committed to investing \$50,000 each toward the establishment of the Ceylon Sapphire Council (CSC). This investment will be matched by a \$350,000 equity investment by the Export Development Board, and a \$600,000 grant from the government. CSC will handle the marketing of upscale jewelry exports, in collaboration with Stephen Webster Ltd, a renowned jewelry designer in the United Kingdom. The Stephen Webster Ceylon Sapphire collection will include 45 pieces designed by Webster, and up to 55 pieces designed by participating companies in Sri Lanka. This initiative is unambiguously a result of the TCI cluster and concerted technical assistance from TCI. Looking at the economic impact, the high prices that the CSC products will fetch are largely matched by high marketing costs. The business plan shows a positive yield for the venture, but the government subsidy is treated as income. If the subsidy is treated as a cost to the economy, as it should be, then the NPV over a five-year time horizon turns out to be negative. Although the initiative may not pay off in terms of benefits that are now quantifiable, it is clearly intended as a strategic move to reposition the local industry into the market for high-quality jewelry. If the effort succeeds, then the benefit to the industry and the economy will more than compensate for the once-off subsidy.¹¹

¹¹ An example of how a once-off subsidy can help domestic producers establish a successful and sustainable new market opportunity is the case of Dilmah Tea.

B. Other Probable Benefits

The estimates given in section A cover only a subset of the cluster initiatives that are likely to generate significant benefits to the economy, and clearly attributable to TCI. For several others, it has not been possible to quantify the benefits at this time for lack of data. But it should be possible to do so before the project ends in 2004. Examples include:

TEA NOTES

The Tea Cluster is working with a leading banker to work out arrangements that will allow tea suppliers to finance working capital requirements by issuing commercial paper that are underwritten by banks, using tea stocks as collateral. More than half of the tea factories depend on advances from tea brokers. By issuing “tea notes” instead, they may reduce financing costs by as much as 3 to 4 percentage points. According to the cluster coordinator, the legal arrangements should be completed within the next few months. Given the size of the industry and the likely size of the cost reduction, the economic impact of this initiative is potentially very large.

LALAN RUBBER SUPPLY CONSOLIDATION

In theory, one advantage of clusters is that personal exchanges among members can lead to new ideas that help to sustain a dynamic and competitive industry. An interesting example has occurred as a byproduct of rubber cluster meetings. The Lalan Rubber Group is a pioneering producer of latex gloves in Sri Lanka. Lalan has aggressive expansion plans, but due to periodic shortages of local latex the company has been considering re-locating its plants to Vietnam or Thailand. At the same time, the Bogawantalawa Plantation (BP) was short of cash for replanting overage trees or expanding operations. Despite the fact that BP was a major latex supplier to Lalan, the heads of the two organizations never discussed their mutual concerns until they met at a cluster meeting. The result was a commitment by Lalan to infuse \$3.8 million of equity into BP to rehabilitate the plantation. As a result, Lalan will remain in Sri Lanka and BP has a bright future. As a result of this collaboration, thousands of jobs will be saved in Lalan and thousands more created in BP.

PILOT PROJECT FOR VILLAGE-LEVEL QUALITY UPGRADE FOR SPICES

The Spice Cluster is working with cooperative associations in five villages to establish pilot projects for improving the quality of spice products through better processes for blanching, thrashing and drying. This will require an investment in new equipment costing Rs700,000 per unit. The cluster is working with the Ministry of Agriculture and Livestock to obtain seed capital, and the Samurdhi Authority to develop a supporting loan program. If the farmers can obtain a 10-20% price premium for their spices, as anticipated, then the pilot program could

be replicated widely. To date, spice traders have not made a commitment to pay higher prices.

HIGH-YIELDING CARDAMOM INITIATIVE

Following discussions within the Spice Cluster about low yields for locally grown spice varieties, one cluster member has imported an improved variety of cardamom from India and shared the plants with the government for distribution to other spice growers. This variety is expected to increase yields from 60 kgs to approximately 1000 kg per hectare.

WEB PORTALS

With TCI technical support, both the Gem & Jewelry cluster and the Ceramics cluster have developed web portals to market their wares to the world. Establishing an electronic venue for shoppers can generate a large increase in demand. The website administrators are monitoring the number of “hits” on these web portals, but no information is being compiled about the number or value of orders obtained over the internet. With cooperation from cluster members, it should be possible to obtain data on the economic impact to date.

C. Other Possible Benefits

For quite a few other cluster initiatives, the impact is either too uncertain to assess at this time, or it is inherently difficult to measure. Examples include:

- ICT: Virtual business incubator
- ICT: Centers of excellence
- Tourism: Institute for Tourism and Hotel Management
- Spices: Maturata plantation study
- Spices: HS code bifurcation for cinnamon
- Gem & jewelry: Gem & Jewelry Institute (CAM/CAD training)
- Ceramics cluster: pilot plant, joint R&D
- Ceramics cluster: joint procurement strategies
- Coir: model mill, joint R&D

Some of these activities will surely make a large contribution to the ultimate impact of the project, even if the impact cannot now be ascertained.

4. Pulling It Together: The Benefit-Cost Test

Table 1 (next page) summarizes the cluster initiatives discussed above. For present purposes, attention focuses on the eight initiatives discussed in section A, namely, the ones which are highly probable, directly attributable to TCI cluster initiatives, and quantifiable using data currently available.

As discussed earlier, the “economic impact” of a cluster initiative is defined here as the *expected net present value of additional incomes* generated directly by the initiative. For the eight activities examined in detail, the lower-bound NPV of net additional income totals **\$156 million**. Factoring in uncertainty about implementation, and the possibility that similar outcomes could have materialized without TCI, the *adjusted* NPV totals **\$69 million**. This is a lower-bound estimate of the economic impact.

Turning to the cost side of the equation, the overall budget for TCI¹² has been examined to identify expenses attributable to the cluster initiatives, as distinct from charges incurred for other project components. After pro-rating overheads, the cumulative total cost of the cluster initiatives under TCI is just under \$7 million.

Using adjusted estimates of the economic benefits (as explained above), the resulting benefit-cost ratio is approximately 10:1. Thus, each \$1 of USAID funding for TCI cluster initiatives has generated \$10 of economic benefits for the economy of Sri Lanka.

It is important to reiterate that this is a *lower bound* estimate, on three accounts. First, the analysis only includes benefits that are highly probably, attributable, and quantifiable using data available at this time. Second, conservative assumptions have been used at every step in quantifying the benefit streams. And third, the analysis excludes potential dynamic effects that are likely to arise as innovations improve the competitiveness of local industries, and indirect benefits that may arise through inter-industry linkages and multiplier effects.

¹² Including Task Orders 801, 828, and 828-mod4.

Table 1
Summary of Economic Impacts Attributable to TCI Cluster Initiatives

		NPV of Income Gain	Adjusted NPV ^a
A. Quantifiable economic impacts (US\$ millions)			
1. Rubber	New plantation program (Moneragala)	119.6	36.9
2. Rubber	Crepe rubber (Lankaprene)	30.6	27.8
3. Gem & Jewelry	Gemstone certification (GemLab)	3.0	2.2
4. Ceramics	LPG procurement	1.8	1.2
5. Tourism	EcoLodge	0.7	0.5
6. Coir	Coir certification for U.S. market	0.6	0.5
7. Tea	Tea color separator	0.3	0.2
8. Gem & Jewelry	Sapphire jewelry branding ^b	-0.4	-0.4
Total		156.4	69.0
B. Other likely economic impacts attributable to TCI, not yet quantified			
1. Tea	Tea notes (issuance of commercial paper)		
2. Rubber	Lalan supply consolidation		
3. Spices	Village-level quality upgrade through farmer's groups		
4. Spices	High-yielding cardamom initiative		
5. Ceramics	Web portal		
6. Gem & Jewelry	Web portal		
C. Potential impacts: realization uncertain and/or benefits unmeasurable at this time			
1. ICT	Virtual business incubator		
2. ICT	Centers of Excellence		
3. Tourism	Institute for Tourism and Hotel Management		
4. Spices	Maturata plantation study		
5. Spices	HS bifurcation for cinnamon		
6. Gem & Jewelry	Gem & Jewelry Institute (CAM/CAD training)		
8. Ceramics	Pilot plant: joint R&D		
9. Ceramics	Joint procurement strategies		
10. Coir	Model mill		

^a Adjusted for estimates of

(a) uncertainty: probability that the results will be realized

(b) attribution: extent to which benefits depend critically on TCI cluster initiative

^b This figure is negative because NPV from business plan is less than the amount of subsidy.

SOURCE: See text.

5. Additional Economic Benefits of TCI

This report has focused on the economic impact of cluster initiatives under TCI. The project has three other major components: support for public-private dialogue on competitiveness; assisting Government initiatives on economic reform to improve competitiveness; and mobilizing a broad consensus and support for competitiveness. These components also have an important economic impact – though it is inherently difficult to measure.

TCI has engaged cluster members in an effort to influence policies promoting private sector growth. The most marked impact of these efforts is the government's assent to allow industry groups to determine for themselves how to use all or some of the revenue generated through cesses. This devolution of funds and authority to the private sector is a radical departure from the previous policy regime.

TCI clusters have also been heavily involved in redefining the role of public-private partnerships. For example, the ICT Cluster, with extensive technical assistance from TCI consultants, has been a leading source of strategic vision and political support for the e-Sri Lanka program. The tourism cluster has played a key role in transforming the poorly functioning Sri Lanka Tourist Board into a Tourism Development Council, with private participation in management planning, regulatory functions, and five regional councils for tourism development; and a Tourism Marketing Bureau as a private corporate body that will receive 80% of funds raised by government taxes on the industry. Also, the Rubber Cluster successfully lobbied the Ministry of Plantation Industries to abandon a proposed cess to fund government-managed rubber replanting schemes. Instead, the cluster has proposed a major program that will be financed and managed by the private sector, in the Moneragala region (as discussed above). The cluster was also instrumental in lobbying for the liberalization of raw rubber imports to strengthen the competitiveness of rubber manufacturers.

TCI has been actively involved in IPR policy, including assistance on the Intellectual Property law which was passed in June 2003. A TCI consultant worked with the National Intellectual Property Office (NIPO) and several clusters to establish branding under the WTO TRIPS

agreement for geographic indicators. As a result, the Tea cluster is pursuing IPR branding for *Ceylon Tea* through the Sri Lanka Tea Board, and members of the gem & jewelry cluster are establishing the Ceylon Sapphire Council to develop a trademark brand of *Ceylon Sapphires*.

TCI also provided policy support to the government through two resident advisors. One has been assigned to the Ministry of Economic Development (MED), which covers six of the eight TCI clusters. The advisor has worked on restructuring the ministry, developing policies on industrial organization and productivity, and preparing for negotiations on bilateral Free Trade Agreement negotiations. The second TCI policy advisor was instrumental in assisting the Prime Minister and the Ministry of Policy Development and Implementation (MPDI) in developing the *Regaining Sri Lanka* strategy.

6. Recommendations on Monitoring Economic Impact

Evaluation the economic impact of cluster initiatives under projects like TCI is critical for justifying this whole approach to private sector development as a use of development assistance resources. This report helps to fill the knowledge gap, but it is only an interim assessment. Further work is needed to refine and broaden the impact estimates, and to document major success stories.¹³

Refining the Estimates. Given the short time allotted for this study (two weeks), it was necessary to take short cuts in the obtaining impact estimates for the initiatives discussed in section III.A. More meetings are needed with resource persons outside TCI to check the information used in the analysis and obtain independent views on possible barriers to implementation and attribution to TCI. It is also necessary to get more feedback from the cluster coordinators about the computations, to ensure accuracy of the key assumptions and results.

Broadening the Estimates. The initiatives outlined in section III.B ought to be included by the impact analysis, but they were not because of data and time constraints. It should be possible to compile reasonably good data for most of these activities. Since some of the impacts may be important, this should be priority for follow-up work.

Documenting the Success Stories. Finally, the follow-up should include the preparation of case studies to document some of the major success stories. Each case study should provide a concise narrative describing the cluster process and characteristics of the initiative. The study should also provide critical answers to questions such as these: In what respect was the cluster approach necessary to produce the outcome? What central factors underpinned the result? What was the role of TCI technical assistance? What lessons can other TCI clusters

¹³ The study was designed to produce provisional estimates, on the assumption that a local-hire staff member at TCI would follow up on the analysis. Part of the consultant's responsibility has been to train the staff member for this purpose, and provide guidance on tasks requiring further attention.

learn to enhance their effectiveness (even after TCI shuts down)? What lessons can USAID learn to enhance the effectiveness of other competitiveness projects?

In addition, it may be very useful to compile more systematic information on the prospective economic impact of initiatives that are less amenable to quantification, such as the activities outlined in section III.C. Even if the benefits are diffuse or uncertain, cluster members should be able to articulate the expected impacts and the likely magnitude of benefits such as higher productivity, lower costs, enhanced value of output, increased export sales, or greater employment. Cluster coordinators should place this on the agenda for discussion and record the results.

The follow-up activities recommended here are unlikely to alter significantly the overall benefit-cost ratio, but they will provide a richer picture of the impact of the project's portfolio of cluster initiatives.

7. Summary and Conclusions

The cluster approach to private-sector development has attracted global attention. Clusters are clearly an important part of the economic landscape in many successful countries. And it makes sense to think that cluster interactions can lead to initiatives that contribute to competitiveness and productivity. Another reason for the concept's popularity is that standard prescriptions for macroeconomic stability and liberalization have proved to be necessary but not sufficient conditions for rapid growth. This realization led to a search for other approaches to accelerate development, such as institutional reforms and microeconomic interventions.

The Competitiveness Initiative in Sri Lanka was one of the earliest USAID-funded projects to pursue the cluster approach. Three years on, one would like to see a variety of large impacts already in place. But experience has shown that it takes time for clusters to gel as effective organizations, to agree on strategic initiatives, and to get activities off the ground. Much of the economic impact of TCI therefore lies in the future. Nonetheless, one can obtain reasonably sound estimates for many of the cluster activities.

Results

This study defines the economic impact of a cluster initiative as the *expected net present value of additional incomes* generated directly by the initiative. The estimates are restricted to cluster initiatives that are (a) highly likely to produce results, (b) clearly attributable to the project, and (c) quantifiable with currently available data. Eight activities satisfy these criteria. Using conservative parameter values, these cluster initiatives are expected to yield an aggregate benefit of \$69 million (after discounting for possible impediments to implementation, and the possibility that similar outcomes could have arisen through other channels). This lower-bound estimate of the economic impact gives a cost-benefit ratio of 10:1 for overall portfolio of TCI cluster initiatives. Out of the eight activities analyzed in detailed, there are two jackpots, with yields over \$25 million, both in the rubber sector. Two other initiatives have a yield over \$1 million; three have a smaller yield; and one has a negative yield in terms of benefits that are presently quantifiable. (The latter initiative is being pursued with a subsidy, on the

expectation that it will help the gem and jewelry industry penetrate high-value international markets.) Another six initiatives are also quantifiable, but could not be included in the study due to data and time constraints.

Patterns

TCI experience does not seem to suggest any clear lesson about which types of cluster activities are most likely to succeed. The initiatives that are yielding measurable impacts (groups A and B in Table 1) cover the gamut. The innovations include joint procurement to reduce input costs, development of new markets, upgrading value in existing markets, introduction of new technology, joint investment, expansion of supplies, improvement in the quality of supplies, and supply-chain integration. Even the two big wins from the rubber cluster involve opposite ends of the value chain: one addresses raw material supplies, while the other is a product upgrade. The implication is that any project to promote cluster initiatives should avoid limiting the activity set to pre-specified approaches. Here again, the idea of pursuing a portfolio of activities makes most sense.

Focusing on specific projects, it is interesting to observe that the portfolio includes just one “quick hit”: the joint negotiation for lower LPG prices by the ceramics cluster. But this observation does not generalize. Even within the ceramics cluster, technical assistance to identify further savings from joint procurement has not produced quick results. It is also tempting to draw a conclusion from the fact that none of the clusters has put together a joint training program with demonstrable results. One would expect this to be an important area for cooperation. Of course, several clusters are pursuing training activities which may pay off in the future. Another possible lesson may be inferred from the one activity with a negative (measurable) return: the sapphire branding program. The financial plan for this initiative works only because of a government subsidy. If clusters become centers for pressing government to grant subsidies and protection,¹⁴ the economic impacts can certainly be negative. But it would be premature to conclude that the sapphire program falls in this category; it may well prove to be an effective catalyst for the industry to penetrate an important and sustainable new market. Only time will tell.

Supporting Conditions

Many of the cluster initiatives would have hit a brick wall without supportive government agencies. This is a familiar theme in discussions of aid effectiveness: aid works best in the presence of good supporting policies. In the case of TCI, the cluster initiatives benefited from

¹⁴ Or if they serve as avenues for anti-competitive practices.

strong and committed leadership from the government that took office in 2002 [date?], particularly from the Prime Minister and the Minister for Economic Development.¹⁵

This observation has two important implications for competitiveness projects in general. First, cluster initiatives will be much less successful in countries where the policy makers are less seriously committed to supporting the progressive private sector. Also, packaging policy-level support with industry-level support may leverage the benefit of both forms of assistance—again, in countries where government is serious about supporting the private sector.

Role of the Project

The role of the project extended far beyond just getting groups together. Nearly all of the main impacts emerged from *groups plus technical assistance*. The technical assistance provided worked as a catalyst for new ideas, a challenge to conventional thinking, a glue to hold the group together, a spotlight on innovation opportunities, and an impetus to motivate action. In short, the TA was essential to help the clusters convert deliberations into well focused plans, action, and results. At the same time, the cluster approach leveraged the impact of the TA, due to the obvious advantages to supplying ideas, marketing arrangements, and technical information to a number of companies at once.

The danger here is that once the project ends, the clusters may lose momentum or become altogether ineffective. This is a common criticism of aid-supported cluster initiatives. In the case of TCI, some of the groups, like the rubber cluster, have such strong support and leadership that they are likely to maintain momentum through their new apex organizations. But some of the clusters may well wilt in the absence of further project support. If this occurs, the flow of new cluster-based innovations for the respective industry will end with the project. Even so, the change in mindset among industry leaders can still be sustained. Indeed, the economic benefits as measured in this study can also be sustained, as long as the innovations supported by the project are fundamentally viable. Once the tea cluster and the University of Moratuwa succeed in developing a low-cost color separator, the benefits of the technology can continue to flow even if the cluster shuts down. The bottom line is that the favorable benefit-cost ratio for the *project* does not hinge on the sustainability of the cluster organizations.

In closing, it may be worth noting that the author of this report is a skeptic about the cluster approach to economic development. While the results reported here are reasonably good, the general paucity of data on the economic impact of cluster initiatives is astonishing. As a

¹⁵ This important observation was suggested by Lakna Paranawithana, coordinator for the Rubber Cluster.

result, the cluster approach has yet to meet the burden of proof as an effective use of development assistance. To remedy the lack of information and resolve the arguments about competitiveness projects, procedures to monitor the economic impact should be part and parcel of every competitiveness project.

Annex. Technical Notes

The Basic Methodology. This report assesses the economic impact of TCI cluster initiatives, focusing on major activities¹⁶ that satisfy three criteria: the impacts are highly likely, clearly attributable to TCI, and quantifiable using information available at this time. Many cluster activities are excluded because implementation is very uncertain, because similar outcomes may have materialized without TCI support (a counterfactual judgment), or because of insufficient data. The ultimate economic benefit of the cluster initiatives will surely exceed what has been estimated here, perhaps by a large amount.

The evaluation is expressed as a benefit-cost ratio. The *benefit* is the expected net present value (NPV) of additional incomes generated directly by the cluster activities (discounted for uncertainty), while the *cost* is the overall amount that has been spent on TCI support of cluster initiatives (including a pro-rata share of project overheads). The cost analysis is straightforward, using project budget records. The benefit analysis, however, required compiling data or reasonable estimates for all of the parameters needed to calculate net income flows for a particular cluster activity. The technical notes below explain the assumptions used to estimate these income flows.

Calculating the NPV of Additional Incomes. For each activity, the net income flow is calculated using actual or (conservatively) estimated values for the initial capital outlay for each activity, the net cash flow (before tax) over a specified projection period, and the residual asset value (where appropriate) at the end of the projection period.¹⁷

The income flow is defined in constant prices, with the net present value calculated at a 15% discount rate. This rate represents the opportunity cost of capital or the risk-adjusted hurdle rate for private investments.¹⁸ With this discount rate, a \$100 investment that yields \$15 per

¹⁶ Some cluster activities are omitted because they are too small to affect the result.

¹⁷ The residual asset value is omitted in some NPV calculations where it is not pertinent or too small to make a difference, or because of data and time constraints. (See technical notes below.) Wherever it is excluded, the result is an underestimate of the NPV. This technicality is one reason, among others cited in the text, to regard the results as a lower bound estimate of the benefits.

¹⁸ The spreadsheets are set up so that other discount rates can easily be used.

year has a NPV of zero. An activity generates *net additional* income for the economy only to the extent that the return on capital exceeds 15%. Where data are available to estimate payments to labor, these are also included as additional net income to the economy (except for high-paid specialized positions such as gemologists for the GemLab). The premise is that, at the margin, additional jobs reduce unemployment.¹⁹

The estimates undertaken for this study exclude indirect effects through inter-industry linkages or multiplier interactions, as well as possible dynamic benefits that may arise as investors and producers respond to higher profits or new market opportunities. In essence, the economic benefit as measured here is determined by the *direct* increase in value added from the cluster activity after accounting for the opportunity cost of capital.

Discounting for Uncertainty. For the most part, the economic benefits lie in the future. Even though the study is restricted to activities that are highly likely, there is still uncertainty about the implementation. Also, for some of the activities there is uncertainty about whether similar outcomes might have arisen through other channels. (After all, one is judging a counterfactual.) Thus, the benefit estimates are adjusted to take into account judgments of (a) the probability that the outcomes will indeed materialize; and (b) the probability that the outcomes are attributable to TCI.

Assumptions for Each Cluster Initiative. The assumptions used for each cluster are spelled out in the summary sheets below.

¹⁹ *Regaining Sri Lanka* emphasizes the need for rapid job creation to absorb new entrants to the labor force and reduce unemployment. An alternative is to assume that the opportunity cost of each job is one person less in subsistence agriculture. Using \$200 per year as subsistence income (roughly in line with bottom-decile figures from the 1999/2000 Sri Lanka Integrated Survey, as reported in *Regaining Sri Lanka*, p. 137), deducting the opportunity cost of labor would reduce the aggregate estimated economic benefit by less than 3%.

Rubber cluster: Moneragala program

Impact type: Increase natural rubber supply

Assumptions

Discount rate for NPV (at constant prices)	0.15	
Price of field latex (Rs80)	0.82 USD/kg	
NPV 30-year cash flow (average of 4 interplanting assumptions) per 250 ha estate block.		Source: Business plan spreadsheet.
-- after tax	76.8 Rs mill.	
-- before tax	105.3 Rs mill.	Tax pyts are transfers, not resource costs
-- including payments to labor in income stream	145.0 Rs mill.	Payments to labor included in the income stream
Exchange rate	97.0 Rs/USD	
Number of 250 ha estate blocks planted per year	8	Half the planting in the business plan.
Time horizon for cash flows	5	years of plantings, with 30 years per block planted

Adjustments

Probability of outcome materializing	80%	See Note A
Attribution to TCI	100% for 5 years.	See Note B

Results

NPV total economic benefit (plantings over 10 years)	119.6 USD million	From 10 years of plantings
Benefit attributable to TCI (see note A below)	46.1 USD million	From 5 years of planting only (see Note A below)
Probability-adjusted benefit (see note B below)	36.9 USD million	

Note A: Probability of outcome materializing

Key industry leaders are committed to and capable of realizing the investment. The business plan indicates an after-tax rate of return between 19% and 36% above 30% (depending on intercropping), so the investment is fundamentally viable. The main uncertainty has been whether the government will lease out the land, but in a recent meeting the Minister of Lands indicated that he will approve the proposal.

Note B: Attribution to TCI

The Moneragala rubber expansion program is directly and fully attributable to activities of the TCI rubber cluster and TA through TCI. Furthermore, there are reasons to believe that broad industry support was essential. First, opening a region for planting would be difficult for any single investor, due to infrastructure considerations. Second, cluster support underpinned the industry's negotiation for obtaining land from the government. Nonetheless, a comparable planting program may well have emerged eventually through other channels in response to the declining trend in rubber production and a firming of rubber prices. Therefore, the benefit calculation assumes 100% attributability to TCI but limits the benefit to new plantings during the first five years only.

Sources: Interviews with TCI rubber cluster coordinator; Chair of rubber cluster; Deputy Chair of rubber cluster; and Secretary of MEP. Data from Moneragala business plan spreadsheets and Sri Lanka Rubber Cluster, *Moneragala Rubber Expansion program: Private Sector Investment Proposals for Government Consideration*, October 2003.

Rubber cluster: Crepe Rubber (Lankaprene)**Impact type: Upgrade product quality****Assumptions**

Discount rate for NPV (at constant prices)	0.15	
Initial investment: 12 factories @ \$10,000	120 USD '000	
Sales volume	5000 mt year 1; 10,000mt year 2; 20,000 mt thereafter	
Sale price of latex crepe, traditional process	1.20 USD/kg	
-- Sale price of LankaPrene	2.00 USD/kg	Actual price for initial orders
Price enhancement	0.80 USD/kg	
Supply cost price of latex crepe, traditional process	1.03 USD/kg	
-- of which processing cost	0.21 USD/kg	20% of supply cost
Additional cost for processing to LankaPrene standard	0.03 USD/kg	15% increase in processing cost
Additional value added	0.77 USD/kg ==>	768.5 USD/mt
Time horizon for cash flow	5 years	See Note B.

Adjustments

Probability of outcome materializing	90%	See Note A
Attribution to TCI	100%	See Note B

Results

NPV of additional net earnings	30.9 USD million
Probability-adjusted benefit	27.8 USD million
Benefit attributable to TCI	27.8 USD million

Note A: Probability of outcome materializing

The technology has been established, the market demand is certain, and the price assumptions are based on actuals. The only uncertainty is the supply response of local producers.

Note B: Attribution to TCI

The introduction of LankaPrene was 100% an outcome of TCI rubber cluster initiative. The concept emerged from cluster discussions about rubber strategy, and TCI funding for TA and a visit to Akron to meet potential customers. However, the innovation is so profitable that major players may well have pursued this avenue at their own expense sometime over the next few years. For this reason, the benefit analysis is limited to a 5-year cash flow.

Sources: Interviews with TCI rubber cluster coordinator; Chair of rubber cluster; Deputy Chair of rubber cluster.

Gem & Jewelry cluster: Gem certification**Impact type: Higher value for gem exports****Assumptions**

Discount rate for NPV (at constant prices)	0.15	
Exports of gems, 2002 (excluding diamonds)	85.5 USD mill.	BOP statistics
Stones cut and polished (%)	96%	From Warner & Harrington (2003)
Cut and polished stones uncertified (%)	95%	From Warner & Harrington (2003)
Uncertified stones suitable for certification (%)	25%	From BusPlan (Warner & Harrington use 60%)
Value of stones suitable for certification	19.5 USD mill.	Derived
Value addition due to certification by GemLab (%)	10%	Warner & Harrington cite 20%, but use 10%
Capital cost of GemLab	0.75 USD mill.	Latest estimate
NPV GemLab running costs	2.2 USD mill.	From business plan
Time horizon for cash flow	10 years	

Adjustments

Probability of outcome materializing	75%	See Note A
Attribution to TCI	100%	See Note B

Results

NPV of additional net earnings	3.0 USD mill.
Probability-adjusted benefit	2.2 USD mill.
Benefit attributable to TCI	2.2 USD mill.

Note A: Probability of outcome materializing

The business plan is complete, the equipment has been identified and costed, skilled workers are available, and the government has agreed to provide funds. The main uncertainties are whether the government will release the pledged funds, and whether certification by a local lab will be sufficiently accepted in the market. The estimates partly account for this by assuming a low utilization rate in the first two years, but there is still a chance that the initiative will not get off the ground.

Note B: Attribution to TCI

The GemLab program is 100% an outcome of the TCI gem & jewelry cluster strategy, and technical assistance from TCI.

Sources: Interviews with TCI gem & jewelry cluster coordinator; Ceylon Gem Testing Center Business Plan (2003); Warner and Harrington (2003).

Ceramics cluster: Group discount on LPG**Impact type: Reduction in principle input cost****Assumptions**

Discount rate for NPV (at constant prices)	0.15	
Total export sales	42	USD million
Costs (50% sales)	21.0	USD million
Energy cost (20% total cost)	4.20	USD million
Initial energy cost saving (5% volume rebate)	0.21	USD million
Second energy price discount (7.5%)	0.32	USD million
Total energy cost saving	0.53	USD million
Time horizon for cash flow	5	years

Adjustments

Probability of outcome materializing	100%	See Note A
Attribution to TCI	100% / 50%	See Note B

Results

NPV of additional net earnings	1.8	USD million
Probability-adjusted benefit	1.8	USD million
Benefit attributable to TCI	1.2	USD million

Note A: Probability of outcome materializing

Already implemented.

Note B: Attribution to TCI

The initial 5% volume rebate was unambiguously a TCI cluster result. The second discount, however, was sparked by the entry of a local competitor to Shell. Although the discount was negotiated by the cluster, larger companies may well have obtained at least some of the benefit on their own. Consequently, the calculation attributes 100% of the initial rebate to TCI, but only 50% of the second one. The limitation of the cash flow to 5 years also reflects uncertainty about the counterfactual.

Sources: Warner and Harrington (2003), confirmed through Interview with TCI ceramics cluster coordinator.

Tourism Cluster: Sinharaja Ecolodge (Pvt) Ltd. (Ecolodge)**Impact type: Joint investment to tap new market****Assumptions**

Discount rate for NPV (at constant prices)	0.15	
Capital cost	135 Rs million	Excludes Rs 30 million equity issue against value of land,
Labor costs, annual	11.9 Rs million	Included in benefit flow.
Exchange Rate	US\$1=Rs 97	
Time horizon for cash flow	10 years	Years 1-5 taken from feasibility study. Cashflow assumed constant for years 6-10.

Adjustments

Probability of outcome materializing	80%	See Note A
Attribution to TCI	100%	See Note B

Results

NPV of additional net earnings	0.7 USD mill.
Probability-adjusted benefit	0.5 USD mill.
Benefit attributable to TCI	0.5 USD mill.

Note A: Probability of outcome materializing

There is a very high probability that this outcome will materialize, given that this initiative is being strongly supported by several key industry players and the feasibility study is based on conservative assumptions .

However in view of the very nature of the tourism industry, which is very sensitive to the security situation in the country, we will estimate an 80% probability of the outcome materializing.

Note B:Attribution to TCI

100% - this has been a direct result of cluster activity. It is conceivable that, given time, a private investor would have adopted a similar concept, given its novelty in Sri Lanka, growing demand in the ecotourism sector and the suitability of the country for such initiatives.

Source: Ecolodge feasibility study; interview with tourism cluster coordinator.

Coir cluster: Certification for US market**Impact type: Market expansion****Assumptions**

Discount rate for NPV (at constant prices)	0.15	
Price fob to China (opportunity cost of sales to US)	150 \$/mt	
Cost of lab certification and marketing in US	80,000.00 \$	
Running cost of maintaining standards for export to US	0.05 of value, maximum	
1. Fiber		
Target increase in sales volume to US	1000 mt	
Price fob to US for hydroseeding applications	230 \$/mt	Cost of processing to hydroseeding standard is fully VA to Sri Lanka
Price gain	68.5 \$/mt	Net of cost to maintain standards for export to US
Income gain on additional sales to US	68500 \$/yr	
2. Logs		
Current volume of sales to US	5,800 logs/yr	
-- in metric tons @ 50 kg per log	29000% mt/yr	
Current value (cif)	400000 \$/yr	
Value per metric ton (cif)	1,379 \$/mt	
Current value (fob)	320,000 \$/yr	
Target increase in sales to US	0	
Target increase in value (fob)	30,400 \$/yr	Net of cost to maintain standards for export to US
Reduction in value of fiber sales to China (fob)	4,350 \$/yr	
Net income gain on additional sales to US	26,050 \$/yr	Cost of processing fiber to logs is fully VA to Sri Lanka
3. Mats		
Current volume of sales to US	330,000 sqm	
- Price per sqm (fob)	1 \$/sqm	
Target increase in volume	133,000 sqm	
Target increase in value (fob)	7581000% \$/yr	Net of cost to maintain standards for export to US
Increased volume in metric tons of fiber @ 0.5 kg per sqm	67 mt/yr	
Reduction in value of fiber sales to China (fob)	9,975 \$/yr	
Net income gain on additional sales to US	65,835 \$/yr	Cost of processing fiber to mats is fully VA to Sri Lanka
4. Total net income gain on additional sales to US		
	160385 \$/yr	
Time horizon for cash flow	10 years	

Adjustments

Probability of outcome materializing	80%	See Note A
Attribution to TCI	100%	See Note B

Results

NPV of income enhancement	0.63 USD million
Probability-adjusted benefit	0.50 USD million
Benefit attributable to TCI	0.50 USD million

Note A: Probability of outcome materializing

The certification process will be completed within a few months by an accredited materials lab at the University of San Diego. There is no indication that the outcome is in question for this critical step. Once the documentation is in hand, it will not be difficult to get the coir listed as an approved material for projects in target states. A 20% discount is applied here to allow for unforeseen impediments and uncertainty about the market response and price.

Note B: Attribution to TCI

This innovation is fully and unambiguously attributable to the work of the cluster and technical support from TCI. There is no reason to think that the process of certification in the United States would have been pursued by individual coir producers or exporters.

Sources: Data from TCI coir cluster coordinator.

Tea Cluster: Locally manufactured tea Color Separator

Impact: value addition from use of less costly color separators

Assumptions

Discount rate for NPV (at constant prices)	0.15
Volume of color separated tea processed per day	2000 Kg/day
Number of machines put in operation	50 per year
Price premium paid on cleaned vs uncleaned teas	6 Rs/Kg
Value addition as a result of using tea color separator	12000 Rs per day per machine
Annual value addition	3120 Rs '000 per annum per machine
Capital Cost of one machine	2000 Rs '000
Exchange rate	97 Rs/USD
Time horizon for cash flow	5 years

Adjustments

Probability of outcome materializing	75%	See Note A
Attribution to TCI	100%	See Note B

Results

NPV of income enhancement	0.25 USD million
Probability-adjusted benefit	0.19 USD million
Benefit attributable to TCI	0.19 USD million

Note A: Probability of outcome materializing

Several important steps have yet to be completed before this initiative bears fruit, but the work is far enough along that results are likely in 2005. The engineering research and design is nearly complete, through the University of Moratuwa. Thereafter, a tender will be issued to line up local manufacturing. It is expected that supply constraints will limit the number of machines put in operation to 50 per year.

Note B: Attribution to TCI

This innovation is 100% a result of the cluster initiative and technical support from TCI.

Sources: Data from TCI tea cluster coordinator.

Gem & Jewelry cluster: Jewelry branding**Impact type: Value addition, market enhancement****Assumptions**

Discount rate for NPV (at constant prices)

0.15

Cash flow projections

From CSC business plan, excluding \$600,000 government subsidy and including residual net asset value

Time horizon for cash flow

5 years

Adjustments

Probability of outcome materializing

100%

See Note A

Attribution to TCI

100%

See Note B

Results

NPV of sapphire branding, net of subsidy

(0.43) USD million

Probability-adjusted benefit

(0.43) USD million

Benefit attributable to TCI

(0.43) USD million

Note A: Probability of outcome materializing

The contracts are signed, the funding is in hand, and the design work is underway.

Note B: Attribution to TCI

This innovation is 100% a result of the cluster initiative and technical support from TCI.

Sources: CSC business plan; interviews with G&J cluster coordinator; Warner and Harrington (2003).