

Strengthening capacities through Learning Alliances: Improving water use implementing cleaner production in the tanneries in El Cerrito (Colombia)

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Abstract

Tanneries in the Municipality of El Cerrito are considered important family-run small and medium enterprises (SMEs). They form an important economic base for the town, as it is a big source of employment. However, many tanneries use outdated and inappropriate technology, leading to contamination of the Cerrito River and possibly to damage to the proposed wastewater treatment plant. Besides, they have limited capacity and few financial resources to implement changes in order to improve their environmental performance. In order to address the issue a learning alliance was organised. Together it developed a project proposal which was funded in 2003 by the national institution of science and technology (COLCIENCIAS). The entrepreneurs (small private sector), the support institutions (CRPML and CDP del Cuero) and the University (Universidad del Valle/Instituto Cinara) with the aim of implementing actions towards of cleaner production. The process that was followed was an application of the model for technology transfer, as developed by Cinara, which is based on the actors' strengths and consensus on solutions.

The main results of the project are the technological solutions proposed by the actors through a participatory action research process, the association of the different levels of the leather chain, the proposals to access "environmental friendly" markets to the leather products and the educational materials for the leather chain.

Introduction to the leather chain in the department of Valle del Cauca (Colombia)

The Department of Valle del Cauca is located in the South West of Colombia. It is one of the most prosperous regions in the country. The El Cerrito municipality is in the centre of the Department, 30 minutes from the capital which is Cali.

In El Cerrito, tanneries are an important source of employment and income due to their intensive use of labour (Table 1) and exporting potential. In addition, they create even more indirect employment and an entire chain of other industries and sellers is dependent on them. The entire leather chain in this Department is shown in Figure 1.

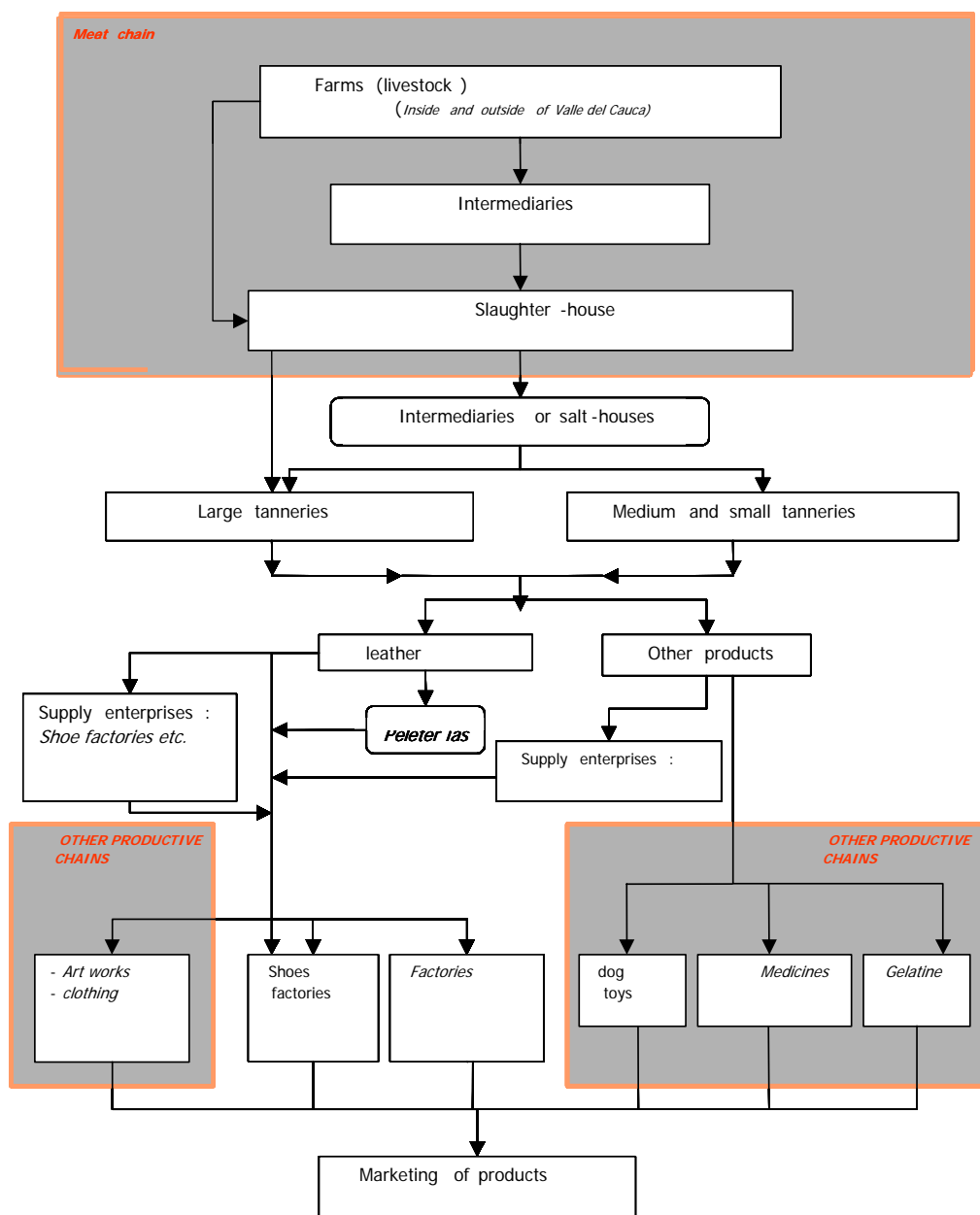
Table 1: Economic impact and characteristics of the tanneries in El Cerrito

Size	Number	%	Direct jobs	Area (m ²)
Large	2	10	240	2000-10000
Medium	7	33	100	600-2000
Small	12	57	40	160-360*
Total	21	100	380	

* Including the owner's home Source: Cinara *et al.*, 2004

Figure 1: The leather chain in Valle del Cauca

Source: Cinara *et al.*, 2004



Most of the tanneries are traditional industries, and can be considered small and medium enterprises (SMEs) (Photograph 1). They are characterized by a low productivity (Table 2), raw material of low

quality and the use of old-fashioned technology. Amongst others due to this, they generate large amounts of contamination with negative impacts to the environment.

Table 2: Productive capacity

Productive capacity	Leathers/month	Operations outside the factory (No)	Barrels (No)	Operating machines (No)
Low	50 - 500	7 - 13	1 - 4	0 - 3
Medium	500 - 2000	0 - 6	5 - 10	4 - 10
High	2000 - 12000	0	10 - 25	11 - 15

Source: Cinara *et al.*, 2004

Photograph 1: Medium size tannery in El Cerrito

Source: Cinara *et al.*, 2004



A great part of the contamination in tanneries comes from the uncontrolled use of resources and raw materials in the production processes. Many tanneries receive poor quality raw material from slaughterhouses and farms, which do not consider themselves as part of the leather chain but part of the meat productive sector. This low quality generates low quality leather, again causing poor quality of the final products. The poor raw material and subsequent production process results in effluents from the tanneries which are high in Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD), Total Suspended Solids (TSS), as well as with high concentrations of chromium and sulphide. Wastewater is now discharged into the River Cerrito, without any treatment, affecting the health of the population living adjacent to the river and possibly creating risks for downstream irrigation activities. There is also contamination by dangerous solid waste such as cuts of semi-processed and finished leather with high content of chromium and other substances. These are sometimes disposed directly into the water bodies, or left on the ground where fluids may infiltrate into the shallow groundwater.

Over the past years, the environmental authority (CVC) has tried to improve the environmental performance of the small factories through penalties. However, any time that CVC threatened to close the factories, social conflicts rose because tanneries are an important economic activity in the municipality.

Tanneries are connected to the urban sewerage system and CVC and the local authorities considered that their wastewater could damage the biological system that has been considered for the municipal treatment plant (biological ponds). CVC expects that the tanneries will not affect the treatment system, if at least they implement the CP. In order to support the tanneries to improve their environmental performance, CVC supported the Regional Centre for Cleaner Production (CRPML) in the project "Cleaner Production in the tanneries of El Cerrito", to propose and implement actions of CP in the processes. The project produced a diagnosis and proposed some short-term solutions. The interest of the entrepreneurs during this project was the main reason to organise the learning alliance that presented a proposal to the national institution of science and technology (COLCIENCIAS).

After this project finished, COLCIENCIAS funded in 2003 a project presented by the alliance (the Centre for Leather Productivity (CDP), CRPML, University of Valle/Cinara and the different stakeholders in the leather chain) aimed to improve the environmental performance of the entire chain. As mentioned, the tanneries do not work in isolation of the rest of the chain, so it was thought important to also include other stakeholders from the rest of the chain in the process. The hypothesis was that a learning alliance would produce sustainable solutions that do not cause social conflicts and solve the environmental problems relating to water use and contamination. At the end, it was expected that the alliance will strengthen the capacities of all participants and the solutions will be the result of a consensus.

This document presents the process of intervention through the learning alliance methodology, and the impact in solving the environmental problems and in increasing the competitiveness of the leather chain.

The process

A learning alliance was organised based in a specific problem which was the excessive use of water and consequently high quantity of wastewater with heavy metals and chemical compounds. The production process needed to be improved through CP to reduce the use of water and chemicals in order to produce "environmentally sound" leather that could have better access to international markets.

The actors in the alliance are: the environmental authority, working at provincial level; the CRPML which works with the productive sector in the south west region of Colombia; the CDP, working with the leather chain at the provincial level; Universidad del Valle /Instituto Cinara, a regional public university; the local authorities and institutions; and the entrepreneurs. Figure 2 shows the learning alliance organized around the improvement of environmental performance of tanneries in El Cerrito. The actors worked jointly because each one of them had a specific interest in the problem and the results benefited all them.

The learning alliance is not an abstract concept. It has to operate in order to solve the problem that joints the actors. In this case, the alliance meets to analyse the possibilities to have specific projects around the leather chain. An opportunity was the resources given by the national institution of science and technology (COLCIENCIAS) for innovation in the Colombian productive sectors. The alliance met to agree the objectives, products and responsibilities for a project and after an agreement was reached the proposal was presented. The alliance included objectives, products and responsibilities for each member.

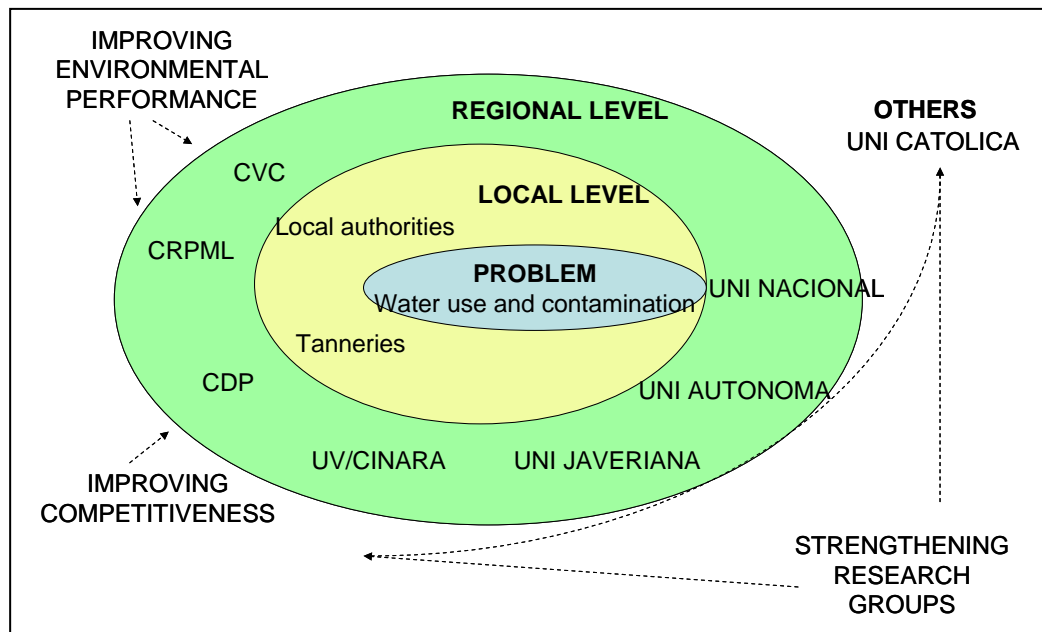
The project where the learning alliance operates (a team learning project) has been developed on the basis of principles and methods based on participatory action research assuring that the problems are analyzed by the actors involved and solutions are a result of consensus building. The actors have adapted the methodology and participated in the spaces of agreement where the entrepreneurs have played a central role. This methodology has allowed creating a trust-base environment that has made possible the participation of all the tanneries in the learning project, which had not been possible in previous interventions. The trust-base environment was created both through specific activities such as the definition of values and principles under which the alliance committed to work and along the joint

work where each actor has respected its responsibilities and the agreements. The interventions made previously by CVC failed because they were based just on punishment actions.

In addition, the ice between CVC and the entrepreneurs was broken and new agreements were reached based on the environmental law. According to this, the entrepreneurs committed themselves to fulfil specific CP aspects of short, medium and long term that were analyzed in the consensus spaces.

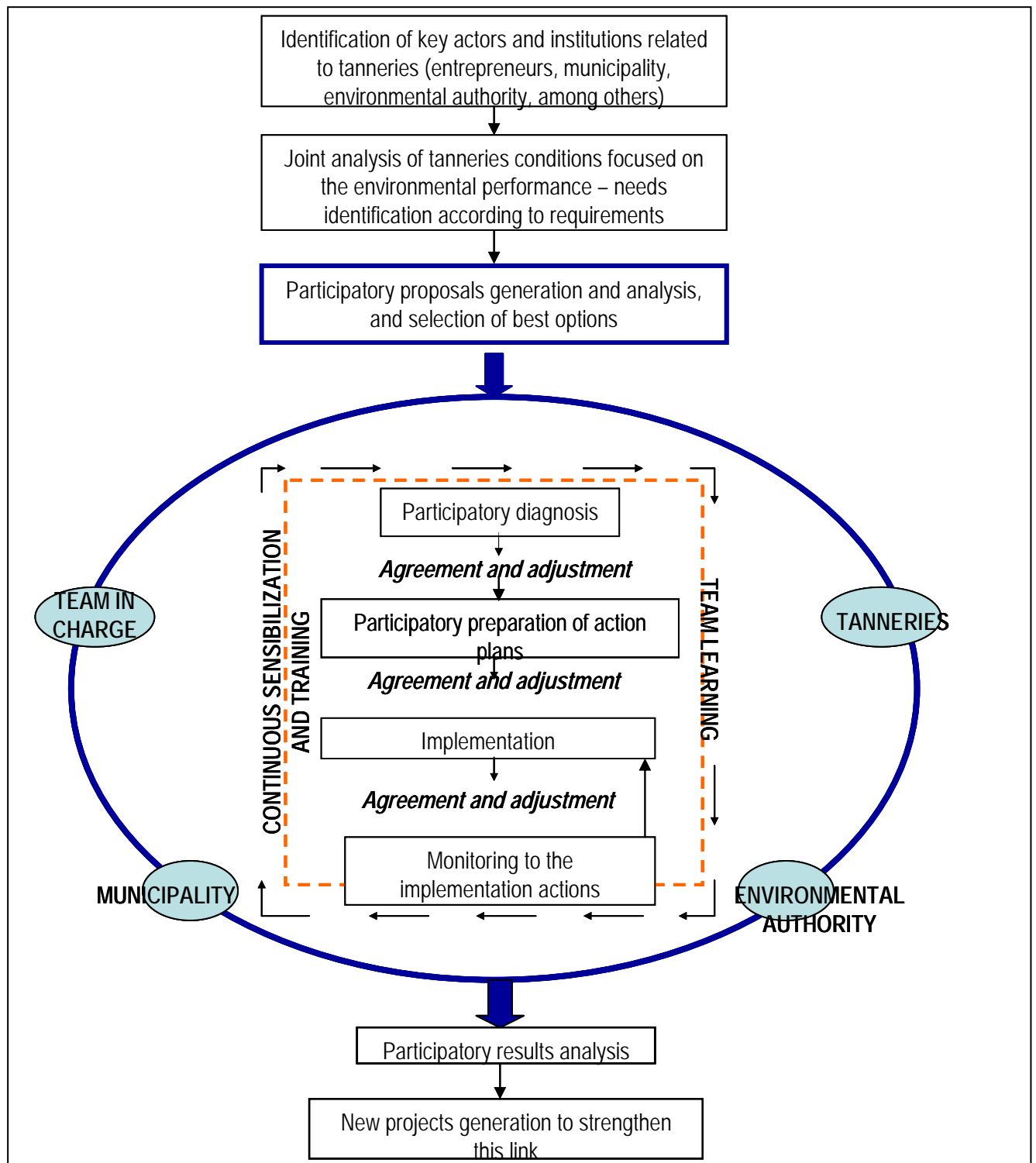
At present, there are no problems in the work. One reason can be that the alliance was created before the project in which it operates and each member agreed to be part of the alliance voluntarily. Another possible reason is that the agreements and responsibilities have been respected by all members. The entrepreneurs are possibly working very well because of the environmental requirements by the environmental authority.

Figure 2: Learning alliance to improve environmental performance in tanneries



This learning alliance, based on specific problems, is open allowing the participation of other universities and research groups through under-graduate and post-graduate students, which strengthens the national capacity. The alliance did join activities such as proposal formulation for funding to COLCIENCIAS, planning of activities given to each one specific responsibility for their development and products, joint monitoring and adjustment. The action scheme for the learning project developed by the alliance is presented in Figure 3.

Figure 3: Action scheme for the learning project developed by the alliance



Results

The process yielded a number of short-term and long term results:

The short-term solutions implemented according to the agreement between the entrepreneurs and the environmental authority showed the reduction of water consumption in the leather production process, as well as a reduction in BOD and TSS. Water quality analyses done by the Universidad the Valle (2004), showed a reduction of 47% in BOD₅ and 64% in TSS in the main sewer of the sewerage system, compared to the analysis in October 2002 (Table 3). BOD and TSS reductions are due to

sludge recovery by the pre-treatment systems that complemented the CP actions. At the level of individual tanneries, the short term implementations reduced the amount of chromium in sludge, leading to a recovery of sludge for the collective level at an 14,000 kg/week, approximately. The processes were improved by the separation of the effluent lines allowing handling in an independent way the effluents with chromium, with sulphides and those that only contained organic matter. This gave the opportunity to reuse or take some advantage of sludge without chromium.

Table 3: Results of the laboratory analysis of the wastewater in the sewerage system

Date	Flow (m ³ /s)	BOD ₅ (kg/d)	TSS (kg/d)
Oct 10-11, 2002	51	1855,98	3106
Nov 13-14, 2004	23,6	975,8	1101,3
Nov 24-25, 2004	21	827	962,9

Source: Convenio No 173 de 2003 CVC- Universidad del Valle

For the longer term, new projects have been formulated according to the financial opportunities and own interests of the alliance members both for new productive sectors and other links. Examples include a proposed project by the CRPML and Cinara to improve the environmental performance of the tourism chain, which will be presented to COLCIENCIAS in a new learning alliance between the Valle del Cauca Department and the Atlantic Coast region, and a project to work with slaughterhouses. An international project is also being formulated.

Some research products have been produced such as the technological innovations in the use of energy, introducing solar energy in the process, an equipment to recover grease to be reused by other productive chains and another equipment to recover the coat, which is being dissolved with chemicals.

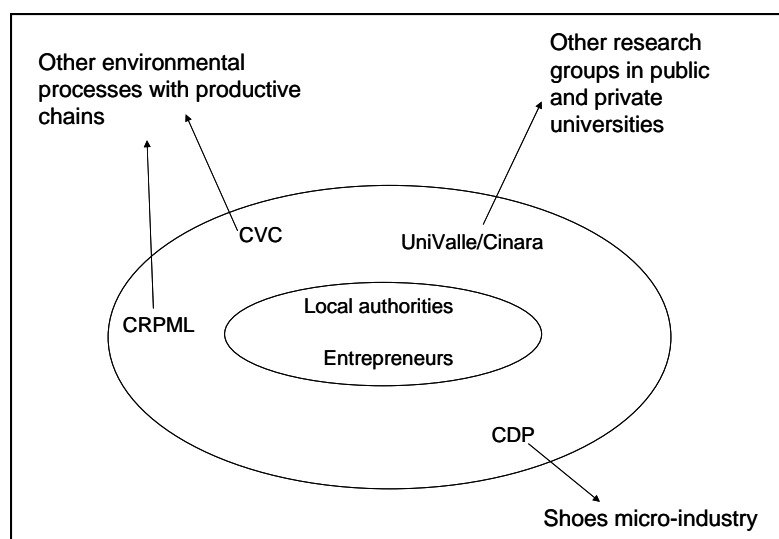
The entrepreneurs have a new attitude towards environmental changes that improve their competitiveness and through the learning project some of them will participate in international fairs in order to initiate potential business.

Through the work by the learning alliance the participating institutions have changed their methodologies introducing participation. The relationship between institutions, especially between universities is improving. The exchange of knowledge has benefited both students and teachers.

COLCIENCIAS added some resources for technology transfer to other regions where the leather chains have similar problems and there will be transfer-of-knowledge products such as research books, articles, manuals, and posters. The National Industry Association (ANDI) asked the alliance for a proposal to repeat this approach in the tanneries located near to Bogotá, the country capital. The alliance's idea is to have a contact institution or person in that region interested in organising a new alliance so that the methodology and results can be transferred and applied.

In an alliance, each actor has their own functions and activities so that each one scales up knowledge according to its social mission. CRPML and CDP are applying the methodology to their own projects. A key factor to institutionalise the knowledge produced within these institutions could be the direct participation of the Directors. The alliance does not expect that CVC changes as it is a big institution with more than 300 employees and several action areas. However, the people directly involved in contamination control are working applying this methodology with the CRPML in other productive sectors. The scaling up scheme is shown in Figure 4.

Figure 4: Scaling up knowledge and products



Lessons learnt

- A learning alliance will work only if it is based on a trust, and works in an environment of trust. Trust between its members is the key to develop joint actions which benefit each member.
- The alliance works around concrete problems and solutions. The alliance does not work in abstract but developing concrete actions to find out practical solutions to solve problems that are affecting each one's interests. That is the function of a learning project through which the alliance operates its actions.
- The alliance can be temporary. As it works around concrete situations, once the problem is solved the alliance can disappear if there are no new projects where the members can work together.
- All members win and all members put something. The participation depends on the evident benefits perceived by each one. If the benefits are clear, the members are usually willing to put anything according to their possibilities such as knowledge, time, equipment and any other resources.
- Each member has its own interest and it must be respected and recognised. The alliance is not an association, where the members usually have the same interest. The value of the learning alliance is that it is created by people and institutions that are so different, with different social functions, backgrounds, resources, knowledge, and interests. Through the alliance, they show that it is possible to be different and in spite of this, to work together looking for the common development. The alliance joins people around a specific problem in which each one has interest.
- Responsibilities must be clear. The learning alliance will develop good work if key phases of the learning project are jointly developed such as project formulation, planning, control, monitoring, and evaluation. The functions and responsibilities of each member must be defined clearly from the very beginning. The coordinator is a key person to maintain the alliance harmonious and working properly.
- Institutionalisation of the produced knowledge is essential. Knowledge produced through the learning projects should be institutionalised in order to change the traditional way used by institutions to develop their projects. If knowledge is not institutionalised, the alliance and its projects are just beautiful things to be showed in international journals, without any impact in the region.

Conclusions

In conclusion, the learning alliance is an excellent strategy to work on concrete problems, based on a participatory process, involving a wide range of stakeholders. CP actions were introduced with very positive results for the environment, the private sector and the region in general because of the joint effort of all members of the alliance.

The interest of each member is clear and is being addressed; so many different results will be produced: better environmental performance of the tanneries, improvement of competitiveness of these SMEs through the environmental progress, and stronger research groups in the regional universities as the researches participate supervising their students' works in the Team Learning Project.

The process is the most important aspect of the work developed by the learning alliance. Solutions should be the result of this process.

Recommendations

The concrete situation should be identified in order to develop a learning alliance because based on a correct identification, the actors will be identified. Actors should agree that the situation is the one that they want to work in.

Learning projects should be developed for the learning alliance to be active and functioning. Without concrete projects, the learning alliance will be just words.

The alliance should be flexible and open to any actor that shows interest in the situation. The values adopted by the alliance should be defined from the very beginning and must be respected while the learning alliance exists.

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