The Vittel payments for ecosystem services: a “perfect” PES case?

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Developing markets for watershed protection services and improved livelihoods

Based on evidence from a range of field sites the IIED project, ‘Developing markets for watershed services and improved livelihoods’ is generating debate on the potential role of markets for watershed services. Under this subset of markets for environmental services, downstream users of water compensate upstream land managers for activities that influence the quantity and quality of downstream water. The project purpose is to increase understanding of the potential role of market mechanisms in promoting the provision of watershed services for improving livelihoods in developing countries.

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[1] The Vittel programme was first explored while developing a series of short case studies of water-related PES for Forest Trends (Perrot-Maître and Davis 2001) and briefly revisited while the author worked at IUCN and attended the Titisee workshop in 2005.

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Acronyms and abbreviations

AGREV	Agriculture-Environnement-Vittel
CIFOR	Center for International Forestry Research
GEMI	Global Environment Management Initiative
IIED	International Institute for Environment and Development
INRA	Institut National de la Recherche Agronomique
IUCN	International Union for the Conservation of Nature –The World Conservation Union
NGO	Non-governmental organisation
PES	Payment for ecosystem services
SAFER	Société d’Aménagement Foncier et d’Etablissement Rural
SGEMV	Société Générale des Eaux Minérales de Vittel
WBCSD	World Business Council for Sustainable Development
USD	US Dollar
WWF	World Wildlife Fund
ZEF	Center for Development Research (University of Bonn, Germany)

Executive summary

This paper describes and analyses the PES programme developed and implemented by Vittel (Nestlé Waters) in north-eastern France. In order to address the risk of nitrate contamination caused by agricultural intensification in the aquifer, the world leader in the mineral water bottling business is financing farmers in the catchment to change their farming practices and technology. The paper examines the methodology used by Vittel, and the ten-year process that was necessary to transform conflict into a successful partnership.

The paper’s main conclusion is that establishing PES is a very complex undertaking, one that requires the consideration of scientific but also social, economic, political, institutional, and power relationships. The ability to maintain farmers’ income level at all times and finance all technological changes was an important element of success, but primary reasons for the programme’s success were not financial. Trust-building through the creation of an intermediary institution (locally based and led by a “champion” sympathetic to the farmers’ cause); the development of a long-term participatory process to identify alternative practices and a mutually acceptable set of incentives; the ability to link incentives to land tenure and debt cycle issues and to substitute the old technical and social support networks with new ones, were all fundamental conditions of success.

Estimating costs and benefits of PES is not always possible. Not all information is public knowledge, and costs are not broken down in a way that allows the separation of costs associated with the PES scheme from others.

The Vittel experience is most likely to be replicable in places where land cannot be purchased and set aside for conservation, and where the risk to business is high while the link between ecosystem health and farming practices is well understood and expected benefits are sufficiently high to justify the investment. Although this set of conditions is more likely to be found in industrialised countries (Nestlé Waters has used a similar approach with Perrier and Contrex in France), it could be applicable to a developing country context provided there is good enforceable contract law.

Over time, PES may need to be complemented with other approaches to address urban-based non-point source pollution.

Finally, the study clearly demonstrates that there is a strong business case for private sector participation in water-related PES (particularly in terms of water quality, as the link with ecosystem protection is more easily demonstrated than is the case for water quantity). Care needs to be taken in order to ensure that PES does not lead to a *de facto* privatisation of the water resource.

1. Introduction

In the past decade, payment for ecosystem service (PES) schemes have rapidly developed around the world. This mechanism is basically a new type of subsidy that aims to protect ecosystem services by providing an economic incentive to land managers to adopt land use or management practices favourable to the protection of ecosystem services. Unlike traditional subsidies, which are financed by taxpayers at large, payments are – at least in theory – financed directly and voluntarily by the beneficiaries of the ecosystem services PES helps maintain. This is why PES is sometimes referred to as a “market-based instrument” or a “market for ecosystem services”. PES encompass a diversity of mechanisms ranging from voluntary compensation schemes for forest maintenance or agro-silvopastoral practices in Central America, to non-voluntary compensation for reforestation in China and Vietnam, trading schemes in Australia and the United States, and sometimes agro-environmental subsidies and certification schemes in the European Union and the United States (for a definition of water-related ecosystem services, see World Resources Institute 2005)[2]. Their scales range from micro-watersheds to entire watersheds that may cut across state, provincial, or national boundaries. The feasibility of transboundary schemes is now gradually being explored (for example WWF is exploring this possibility for the Danube River).

PES terminology is applied to a wide range of very diverse situations and there is no single definition of PES. In an attempt to formally define PES and clarify the concept, Wunder (2005) proposes a set of five basic principles:

A PES scheme is:

1. A voluntary transaction where
2. A well-defined environmental service (or a land use likely to secure that service)
3. Is being “bought” by at least one buyer
4. From a (minimum of one) environmental service provider
5. If, and only if, the environmental service provider secures environmental service provision (conditionality)

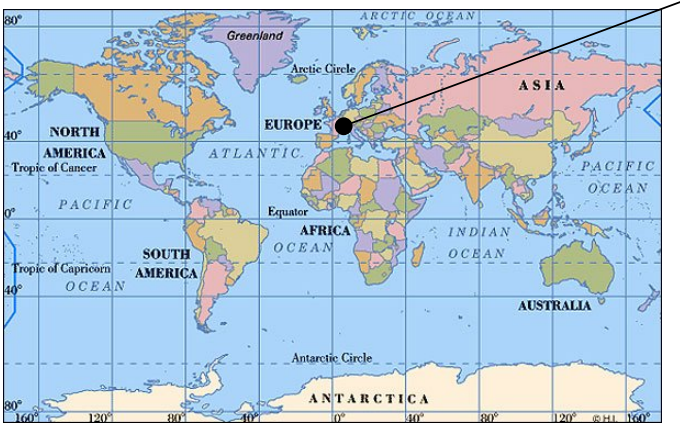
Although simple in appearance, this definition hides many technical complexities. So few existing schemes actually fulfil these conditions that the question has been raised as to whether these schemes actually exist in practice, and if aiming for a perfect PES scheme makes any practical sense at all. This paper examines the case of Vittel (Nestlé Waters) in north-eastern France. It explores the extent to which the case illustrates a “perfect” PES scheme, the reasons for its success, and the insights gained. Issues of financial sustainability, replicability, limitations of the PES approach, and a reflection on the potential role of the private sector in financing water-related PES, are also addressed.

[2] A range of case studies mechanisms can be found in Landell-Mills and Porras (2002) and its forthcoming revisited version, and in IIED-CIFOR- ZEF-Forest Trends-Katoomba Group Workshop (2005). For a quick overview of existing mechanism see also Perrot-Maître and Davis (2001). For a review of the practical issues linked to water-related PES, see the IUCN toolkit *PAY-Innovative financing mechanisms for Watershed Services*, (forthcoming).

2. A little history

Vittel mineral water originates in ‘Grande Source’ (‘Great Spring’) located in the town of Vittel at the foot of the Vosges Mountains in north-eastern France (see Figure 1).

Figure 0: Location of Vittel, France (Sources: http://images.google and http://www.rionde-sa.fr/images/plan/map-france.gif)



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Water comes from a 6,000 ha aquifer 80m below ground and is lifted naturally to the surface through a natural geological fault. The properties of this water – reputed to cure kidney ailments – have been well known since Gallo-Roman times. In 1854, the spring was purchased by the Bouloumié family and a spa developed in the town of Vittel. Rapidly the reputation of ‘Grande Source’ spread and people travelled from all over Europe to drink its waters.

The idea of bottling and marketing the water developed and in 1882, the Société Générale des Eaux Minérales de Vittel (SGEMV) and the Vittel brand were created. By 1898, one million bottles had been sold. In 1903 the French National Academy of Medicine declared the waters from Grande Source (and the contiguous Hépar Spring, well known for curing liver ailments) beneficial to public health and a permanent protection perimeter was installed around the springs. That same year, SGEMV sold 3 million bottles of water (growing urbanisation in Europe playing a clear role in this trend).

Figure 1: Billboard welcoming visitors to the spa town of Vittel (Photo: D. Perrot-Maître)

A century later, one billion bottles of Vittel mineral water are sold every year, in 70 countries. Sales are concentrated in Europe (88%), of which France accounts for 45%. Germany, Belgium and Great Britain are also large consumers accounting for 21, 10 and 9% of the

sales respectively. The name Vittel is known all over the world and the brand name has always been strongly associated with images of health and vitality.
In 1969, the Nestlé group purchased 30% of the de la Motte family stock (then owners of the Vittel brand). At the time, SGEMV ranked third on the world market for mineral water. In 1992, the company (spa and bottling plant) was sold to Nestlé Inc., whose bottled water division subsequently became Nestlé Waters in 2002. Vittel is one of the ten top selling brands out of the 75 brands marketed worldwide by Nestlé Waters. In 2005, Nestlé’s five international brands (Perrier, Vittel, S. Pellegrino, Contrex and Acqua Panna) made up 23% of the revenue of Nestlé Waters (Bergrem, 2006).

3. Ensuring the quality of Vittel waters: a successful public-private partnership

3.1 A constraining legislation

Maintaining water quality is essential to the entire water bottling business. Not all waters are the same and the ‘quality’ requirements vary by water type and country of origin. Selling ‘natural mineral water’ is the activity where the legislation is the most constraining and the reputational risk is especially high. Vittel waters are labelled ‘natural mineral waters’. This implies water must come from a well-protected specific underground source and the composition of the water must be stable. The water must be bottled at the source.

Vittel waters are characterised by a total absence of nitrites and a particularly low level of nitrates. To be labelled ‘Vittel’, the water cannot contain more than 4.5 mg of nitrates per litre and must not contain pesticides. In comparison, the maximum nitrate rate in France is 15 and 50mg/l for mineral and tap water respectively. French legislation dictates that, if mineral concentration changes, the right to use the ‘natural mineral water’ label (and therefore the business associated with the brand name) is lost. How to ensure this stability varies from country to country.

Figure 2: Vittel – a reputation based on an enduring image of health and vitality (Photo: D. Perrot-Maître)

In France the legislation is very strict. Apart from elimination of natural unstable elements such as iron and manganese, no treatment is allowed for ‘natural mineral water’ and stability has to be achieved naturally. Water quality is so crucial to business operations that every day over 300 tests of water quality are carried out in the central laboratory of the Product Technology Center in Vittel (Croville, 2006). This is in addition to the tests conducted several times per day at each individual plant. In other countries (such as in the United Kingdom and the United States for example) treatment is authorised, which significantly reduces business risk. (How water is treated depends on the type of water and the local legislation of each country.)

In the early 80s, the de la Motte family, then owners of the Vittel brand, realised that the intensification of agriculture in the Vittel catchment posed a risk to the nitrate and pesticides level in Grande Source and consequently to the Vittel brand. The artesian spring for Vittel’s Grande Source is located in the thermal park and all farms in the catchment are located upstream from the spring.

In the Vittel catchment, as in many places in France and in Europe, the traditional hay-based cattle ranching system had been replaced by a maize-based system. Free range was limited while stocking rates increased. The increased nitrate rate was caused primarily by the heavy leaching of fertilizers from the maize fields in the winter when fields are barren, overstocking, and poor management of animal waste.

3.2 Identifying alternatives

Because French legislation prohibits any treatment, the family considered five alternatives to ensure water quality over the next 50 years (Déprés et al. 2005):

1. Doing nothing.
2. Relocate to a new catchment where risks are lower.
3. Purchase all lands in the spring catchment.
4. Require farmers to change their practices through legal action.
5. Provide incentives to farmers to voluntarily change their practices.

Table 1, below, summarises the set of options considered.

Table 1: Options considered for protecting the water source

Options	Feasibility
Doing nothing	Too costly and risky as changes in water characteristics could imply closing down the business.
Relocate to new catchment where risks are lower	Would imply losing the Vittel label and the premium price that goes with it.
Purchase all lands in the spring catchment	Not feasible. French legislation does not allow sale of agricultural land for non-agricultural purpose and Vittel would not have the capacity to manage all this land. Social protests also likely if too much land is sold to non-farmers.
Use legal action to ensure farmers change their practices	No reason to impose this change on farmers. Legitimacy of legal action highly questionable because there is no case (nitrate levels are still within acceptable levels) and because it is not technically possible to demonstrate the responsibility of individual farmers. Voluntarily transforming agricultural land into pastureland judged unfeasible by farmers and rejected.
Provide incentives to farmers to voluntarily change their practices	Only alternative left. The challenge is to make Vittel and farmers' interests coincide so that it is in farmers' interest to cooperate.

The first two solutions were prohibitively costly. 'Doing nothing' was too risky because high input farming promoted by European agricultural policy is incompatible with Vittel's water quality requirements. The bottled water market is extremely sensitive to water quality and competition among water bottlers is high. By way of some examples: the Perrier experience with benzene contamination had led to the recall of several million bottles in 120 countries at a cost of USD 263 million and a decline of market share from 49 to less than 30% in the UK. In Brittany, two industrial bottlers have been forced to close or abandon springs because of the nitrate content due to farming activities. In June 1999, Coca-Cola was forced to recall 65 million cans of Coke in Belgium and France after more than 200 people became sick. The company's inability to recognise the problem at first affected its image and led to a 10 percent drop in stock price and temporary bans in several countries.[3]

'Relocating' would have implied losing the 'Vittel' spring brand and the right to label its water as 'natural mineral water'. This would have had huge financial implications. For example in France, Vittel water is comparatively expensive, on average 50% more than Aquarel water, a spring water produced by Nestlé but which comes from different springs (Déprés et al. 2005).

[3] http://www.commercialalert.org/news/archive/2006/03/hard-times-for-soft-drinks

The third alternative was not feasible. French legislation prevents the sale of agricultural land for non-agricultural purposes. In the event that Vittel had been able to purchase all the land, it did not have the competence to manage all of it – and even if it did, it is believed such an intervention would have raised strong protest from the farming organisations and the public (Barbier 2004, cited in Déprés et al. 2005).

The fourth alternative was explored but at the time the issue was the instability of the nitrate level, and the risk of it eventually reaching an unacceptable level. The nitrate rates were still below the maximum level authorised by law and a legal action could not be justified. Even if such an action had been intended, it would have been impossible to prove the responsibility of individual farmers – making a lawsuit an unlikely, and costly, solution. Even if nitrate rates had reached a level above the allowed level for mineral water, a legal action would still be questionable as the existing legislation does not address the issue adequately enough to make the approach entirely legitimate and acceptable. The legislation on mineral water protection did not provide insights either. Mineral water protection in France is still governed by a law enacted in 1856 which prevents drilling in the protection zone by other parties, but does not address water quality (Croville, 2006). Equally, the 1977 European Directive on Mineral Waters specifies that mineral waters must be naturally protected but provides no recommendations on how to do this.

In 1988, Vittel proposed to farmers with land in the protection perimeter that they transform their land into grassland, a solution outlined by a group of experts in the French Committee for the Reduction of Water Pollution by Nitrates. Farmers felt the proposal was not adapted to their production system and rejected it (Déprés et al. 2005).

Only one alternative was left: to convince farmers to change their farming practices, and develop a system of incentives attractive enough for them to want to do so.

3.3 Understanding farmers

In 1989 Vittel, in partnership with the French National Agronomic Institute (Institut National de la Recherche Agronomique – INRA), launched a four-year multidisciplinary action research programme called ‘Agriculture-Environnement-Vittel’ (AGREV). The objective was threefold: understand the relationship between actual farming practices and the nitrate rate in the aquifer; identify and test the practices necessary to reduce and maintain the rate of nitrates at the desired level rate; and identify incentives necessary for farmers to change their practices.

Extensive hydro-geological modelling was conducted in the perimeter and showed that ensuring a nitrate rate of 4.5mg/l in Grande Source required maintaining nitrate levels at the root zone (up to 1.5 meters below the surface) at 10mg/l. The sub-catchment was modelled at sub-catchment, farm, and plot level to test the technical and economic feasibility of the proposed alternatives.

A four step methodology was developed:

1. Understand the farming systems and why farmers do what they do.
2. Analyse the conditions under which farmers would consider changing farming behaviour.
3. Identify, test, and validate in farmers’ fields the management practices necessary to reduce the nitrate threat.
4. Provide financial and technical support to farmers willing to enter the programme.

Unlike conventional approaches in agriculture, which focus on the agronomic aspects of practices, the methodology focused initially on understanding the history, the geography, and the sociology of the area and its people. Scientific and economic research were only introduced later after a dialogue had been successfully established between Vittel and the farmers, compatibility between farmers’ and Vittel’s objectives had been demonstrated, and the idea of a mutually beneficial partnership accepted.

The farm typology developed showed there was no such a thing as a “typical farmer” in the area. Instead there were four groups of farmers, each with a different set of livelihood strategies, objectives and constraints, as well as a varied willingness and capacity to adapt to change (Agrivair, 2006).

Group A: composed of small farms, averaging 19 hectares. Activities concentrate on cattle-raising for meat production, and hay cultivation. Farm households tend to be female-headed, men hold outside employment. Farmers are older than in other groups (over 50 years old) and farming activities will stop when they retire. In 1988 there were four farms in this group.

Group B includes farms of less than 50 ha, specialising in milk production, with hay and maize cultivation. The continuity of farming activities is uncertain once the present farmers retire. In 1988, eight farms fell in this category.

Group C is composed of farms of less than 135 ha, producing milk, meat, hay and maize with a good level of productivity. Farmers’ ages are younger than for groups A and B (about 40 years). Farming activities will continue after the farmer retires. 12 farms were in Group C in 1988.

Group D are farms larger than 135 ha, producing the same crop as those in Group C but with a focus on meat production and maize. Their level of productivity is much higher than for the other groups and practices are highly technical. Age of farmers is also about 40 and it is likely that children will take over farming activities once the present farmers retire. There were 13 farms in group D in 1988.

In addition to farmers’ age, productivity levels, and farm size, groups C and D share a high level of debt: short-term debt because of the necessity of investing in mechanisation as more land is being worked by fewer people, and long-term debt linked to land acquisition.

Vittel chose to focus its work with farmers in groups C and D since they, and their children, were the ones interested in continuing farming. They also clearly displayed the entrepreneurial spirit and the technical capacity to adapt to change and learn new practices.

3.4 Understanding the science

Simultaneously, the agronomic research conducted led to the conclusions that in order to maintain nitrate rates below 4.5 mg/l in the aquifer, the nitrate rate had to be lower than 10mg/l in the root zone. A number of practices were identified to maintain this rate and a zero pesticides level:

- Give up maize cultivation for animal feed (land under maize production shows nitrates rates of up to 200mg/l in the root zone).
- Adopt extensive cattle ranching including pasture management (hay and alfalfa rotation so that farms produce all animal feeds themselves).
- Reduce carrying capacity to a maximum of one cattle head[4] per hectare.

[4] Stocking densities are expressed in UGB (Unité Gros Bétail) or the equivalent of an animal of 600kg.

- Compost animal waste and apply optimally in the fields.
- Give up agrochemicals (chemical fertilizer replaced with composted manure, no pesticides).
- Balance animal rations to reach optimal milk productivity and farm profitability.
- Modernise farm buildings for optimal waste management and storing.

3.5 Matching people and science: a ten year process of participatory research and negotiation

The changes required were quite drastic. They implied the adoption of a land- and labour-intensive system and heavy investment when land, labour, and capital were precisely what farmers lacked.

Young farmers work for the most part alone and have mechanised accordingly. The extra labour required to compost manure and apply it was therefore a constraint. Another obstacle to the Vittel proposal was the lack of capital. Farmers had high levels of debt: short-term debts linked to the prior purchase of farm equipment necessary for the intensive farming system now being promoted by the Common Agricultural Policy (with subsidies from the European Union – every year, farmers receive 1,000 euros per hectare of irrigated maize from the European Union), and long-term debt linked to land acquisition.

In France, inheritance laws stipulate that lands must be divided between all siblings, whether they farm it or not. The sibling taking over the family farm therefore finds him- or herself obliged to purchase the land of the other siblings unless the latter agree to leave their land in free usufruct. Because of the high unemployment rate in the area and the need for cash, people inheriting farmland tend to sell it rather than leaving it in usufruct. Another reason for debt linked to land when a farmer’s parents are still alive is the necessity for the young farmer taking over the farm to purchase his or her parents’ lands to provide them with some cash and compensate for the low value of agricultural pensions. To purchase land farmers must take a bank loan (generally for 15 years); this implies that they can only become full owners of their land after this period of time. Land debt is very prevalent in this part of France where it is estimated that about 87% of the land is purchased through bank loans (Pierre 2006).

Reverting to an extensive farming system was simply not possible unless the right system of incentives was developed. This implied addressing the land, labour, and capital shortage all at once. Adopting a new farming system implied that the farmers had an interest in this change in the first place so that a dialogue could be established, and that they were willing to change under a number of mutually agreed conditions.

The dialogue between the farming community and Vittel was initiated in 1989, through the establishment of AGREV. Farmers were invited to participate in the research action programme and work with the researchers on identifying acceptable conditions for a new production system that would be compatible with Vittel’s objectives.

Despite all the scientific knowledge accumulating and the eventual willingness of both parties to reach an agreement, ten years were necessary to complete the bargaining process and convince all farmers actively engaged in the activity to change. This was due essentially to the heterogeneity in farming situations, and the difficulty in reaching agreement on how to value the cost of changes and the size of compensation. Lack of trust on both sides complicated the valuation disputes, increasing transaction costs and lengthening the time necessary to reach an agreement (Déprés et al. 2005).

The main issue of contention in the valuation process was the choice of the basis to evaluate the level of compensation to farmers. Should the baseline be based on farmer’s costs or on Vittel’s benefits? If based on the opportunity cost to the farmer, how could calculations reflect the heterogeneity of the farms?

A. The level of compensation to be negotiated could not be lower than the opportunity cost of change for the farmers plus a little extra – to be negotiated – to provide an incentive for modifying practices. This cost included the loss in agricultural output incurred by changes in farming systems plus the investment and learning costs linked to adopting new practices.

B. The upper limit was the opportunity cost to Vittel or the increased value of Vittel water because of maintenance of water quality (or avoided market losses). In practice, the upper limit would have to be a little lower than this otherwise Vittel would get no profit at all from the changes since all of it would be distributed to farmers. Of course, there was great uncertainty attached to the benefits for Vittel.

Predictably, in order to evaluate the level of their compensation, farmers wanted to use the benefit to Vittel while Agrivair (or Vittel) wanted to use the opportunity cost to the farmer. Farmers were in a good position to negotiate their level of opportunity cost as they knew the potential of their farms and the costs and impacts of changes, and they challenged the estimated values. Some farmers even asked for reliable data on the sustainability of the Agrivair proposition.

Each farmer located in the strategic area had a monopoly power because his or her land could not be substituted with others and a large proportion of the farm was located in the spring catchment. Because of the configuration of the basin (all farmlands were located upstream from the spring area and varied in their percentage of land within the protection perimeter and their distance to the spring), each farmer could individually influence the nitrate rate. A farmer next to the spring could alone increase nitrate rate in water and jeopardise the entire negotiation process. The strategic location of the farmland – with each farm having the potential to impact water quality – led to opportunistic behaviour which increased transaction costs significantly (Déprés et al. 2005).

Farmers’ unions and other agricultural organisations were concerned that the changes would disturb the local farm economy and some farmers influenced by them were reluctant to accept the contract. On the other hand, because Nestlé Waters Vosges (Vittel, Contrex and Hépar) is a major employer in the basin (1,800 jobs for a population of around 10,000 in Vittel and Contrexéville)) and water quality a key factor, the proposal appeared legitimate to many farmers who could see the benefits of maintaining the Vittel business. Many farmers had their own family members employed by Vittel and local development was at stake in a region where unemployment has been rampant for decades.

A major step was taken in 1992 when Nestlé Waters, then full owner of Vittel, created Agrivair, an intermediary responsible for negotiating and implementing the programme. Agrivair was strategically located just outside the town of Vittel, close to farmers and farmers’ associations. The Director of Agrivair was formerly employed with the INRA team that worked on AGREV and was well known to the farmers and stakeholders in the area. This contributed to ensuring continuity between the design and the implementation of the project and was critical to facilitating the communication of the results of scientific research to the farmers.

3.6 The incentive package

Ultimately, a package of incentives was developed in collaboration with farmers and agreed upon.

1. Long term security through 18- or 30-year contracts.
2. Abolition of debt linked to land acquisition, and land acquired by Vittel left in usufruct for up to 30 years.
3. Subsidy of, on average, about 200 euros/ha/year over five years. This is to ensure a guaranteed income during the transition period and reimburse the debt contracted before entering the programme for the acquisition of farm equipment. The exact amount is negotiated for each farm.
4. Up to 150,000 euros per farm to cover the cost of all new farm equipment and building modernisation.
5. Free labour to apply compost in farmers’ fields. This is to address the labour bottleneck and ensure optimal amounts are applied on each plot. These amounts are calculated for each plot for each farm every year, and individual farm plans are developed every year.
6. Free technical assistance including annual individual farm plans and introduction to new social and professional networks. This is particularly important as giving up the intensive agricultural system alienated farmers from traditional farming networks and support organisations such as the Farmers Federation and the Chamber of Agriculture.

Terms of contracts such as the time horizon, guaranteed income during the transition period, and farm equipment investment are discussed with each farmer and adjusted accordingly.

Simultaneously, to developing AGREV – and upon approval from the local Société d’Aménagement Foncier et d’Etablissement Rural (SAFER) – Agrivair had also purchased lands available in the area, some of them from farmers in groups A and B choosing to retire, or from farmers in groups C and D, hence cancelling their long-term debt (Déprés et al. 2005). (In France, SAFER are private institutions created by the public sector to intervene in the farmland market. The SAFER have priority over land and farms transactions in their area. They can use a pre-emption right on any sales of farms and farmlands which they later sell back to interested farmers. The objective of their intervention on the land market is to help farmers access the land market and promote farm efficiency through farmland consolidation (“remembrement”). The arrangement also helps young people who want to start farming to acquire land at acceptable prices.) In less than five years, Agrivair had acquired 1,700 ha (or 50%) of the land located in sensitive areas. The land was then given in “prêt à usage” (usufruct) in exchange for signing a 18- or 30-year contract.

The “prêt à usage” is a legal category that was specifically created for this programme. At least in principle, it allows Agrivair to take the land back from farmers who do not comply with the terms of the contract, although this has never happened and is not expected to happen since once farmers have adopted the new farming system and made all the investments necessary it makes no economic sense to revert to the former system.

Figure 3: Farming landscape in Vittel catchment after the programme was implemented (Photo: D. Perrot-Maître)

The programme was ultimately successful. By 2004, all 26 farms in the area had adopted the new farming system; 1,700 ha of maize had been eliminated; and 92% of the sub-basin was protected. The programme speeded up the retirement of the marginal farmers (groups A and B) who sold their land to Agrivair. The number of farms in the sub-basin declined from 37 to 26 while average size farm increased to 150 ha as the extensive production required additional land. A clear indicator of success has been the request from young farmers who have taken over the family farm to enter into 30-year contracts. At present, all farmers have signed 30-year contracts. Table 2 below illustrates the evolution of farm types before and after the programme.

Table 2: Evolution of farm size before and after the Vittel programme (Source: Agrivair presentation 2006)

Farm type	1988	2006
Group A (19 ha average)	4	0
Group B (less than 50 ha)	8	1
Group C (less than 135 ha)	12	12
Group D (more than 135 ha)	13	13

4. Is the Vittel programme a perfect PES scheme?

The idea for the programme was initiated by the de la Motte family, taken over by Nestlé’s bottled water division, and implemented under the leadership of Agrivair. There is one buyer and 26 sellers, who participate on a voluntary basis. An intermediary institution was created to facilitate transactions, lead negotiations, co-ordinate design, and implementation and monitor compliance.

The contracts are differentiated according to the cost structure and location of the individual farms. The programme targets farms which can really make a difference in terms of water quality.

The link between ecosystem service (water filtration, and maintenance of adequate levels of nitrate in the plant sub-root system) and management practices has been established scientifically at the sub-basin and plot level. A baseline has been established and the management practices recommended were based on four years of intensive farm modelling and continuous on-farm testing.

Payments are not conditional on the change in nitrate rates in the aquifers as the contribution of individual farms to water quality in the spring is impossible to establish. Rather they are based on new farm investment and the cost of adoption of new farming practices. Optimal rates of manure application are established for each farm plot every year and manure applied by directly by Agrivair labourers to ensure that optimal rates are applied. To fine tune recommendations made to farmers, INRA monitors the nitrate rates all year round at 17 sites across four soil types and two types of farming systems. Agrivair monitors the farming practices, the good use of new building facilities, and the livestock stocking rate. Farmers’ compliance with the new extensive farming system is not an issue since once they have implemented the switch, farmers have no incentive at all to go back to their former practices.

The Vittel programme illustrates what a “narrow” PES would look like. Ideally, a perfect PES would be able to establish a precise link between farmers’ practices and nitrate and pesticides rates in the aquifer – although, given the complexity of hydrogeological relationships, it is doubtful if any programme could ever be expected to do this.

In terms of sustainability of the programme’s results, once farmers have undertaken the transition, the farming system is sustainable since it was designed to maintain farm income at all times. A few farmers decided to switch to organic milk production to increase the profitability of their operation but they found themselves unable to market the milk on the organic market. The reason for this is that in France, whenever milk producers have a contract with a cooperative, the milk belongs to both the producer and the cooperative and, regardless of its quality, cannot be marketed independently of the cooperative.

More importantly for practitioners, the Vittel experience provides many useful insights and lessons.

- Establishing PES programmes is a very complex undertaking.
- Primary reasons for success are not necessarily financial.
- The experience could be replicated.
- PES alone may not be sufficient to guarantee environmental services are provided.
- There is a business case for private sector participation in PES.

5. Establishing PES programmes: a very complex undertaking

5.1 Costs and benefits

The Vittel experience illustrates the complexity linked to the interactions between technical, economic, social, legal and political aspects and the importance of taking all facets into account when developing PES programmes.

It also illustrates the difficulty in estimating the cost of PES programmes. There are no data available in the public domain – with the exception of a study published by INRA in 1997, which estimated that over the first seven years, Vittel spent over 24.25 million euros, or an estimated 980 euros per hectare per year (INRA 1997; Agence de l'Eau 1999). This is equivalent to 1.52 euro per m^3 of bottled water produced. Of these, 9.14 million euros were spent on land acquisition, 3.81 million on investments in farm equipment, and 11.3 million in farm financial compensation (INRA-SAD-VDM 1996).

Table 3 summarises the costs and benefits to Vittel and the farmers

Table 3: Costs and benefits of the programme

	Costs	Benefits
Farmers	No direct financial cost but high transaction costs: cost of learning new practices and participating in identification and testing of practices and incentive system, and negotiations.	Secured long term farming (30 years). Cancelling of short-term and long-term debt. Additional land.
Vittel-Nestlé Waters	First seven years: Land acquisition: 1.14 million euros Farm equipment: 3,81 million euros Farm financial compensation: 11.3 million euros. Does not include cost linked to establishing and operating Agrivair (which is at least partially self-financed).	Eliminated business risk (business of one billion bottles a year).

The question of whether or not the investment was economically justifiable was raised early in the process. The French National Agronomic Institute demonstrated that under the assumption that one hectare of well-managed pasture produced 3000m^3 of mineral water every year, the scheme was economically feasible (INRA 1997).

Taking into account the number of farms entering the programme each year and their area, a rough estimate could be made of the income subsidy and the investment in new building. INRA financed the salaries of the researchers for four years (or the equivalent of 20% of the research cost). The Rhin-Meuse Water Agency paid for 30% of the building monitoring expenses. Whilst these numbers could be estimated, there is no way to estimate the total transaction costs associated with the programme and the cost of operating Agrivair. Agrivair annual budgets are not public knowledge. Even if they were, according to the Agrivair Director, it would not be possible to separate out the expenditures associated with interventions in the farming sector from other types of interventions. In the last few years, Agrivair started working outside the farming communities to address urban pollution, and

staff and equipment are employed in a diverse set of interventions. In order to reduce costs and optimise staff and equipment, Agrivair sells its services outside Nestlé Waters and generates revenues. For example, it uses its equipment to remove snow in front of factories in the winter[5] and it maintains the thermal park and the golf course in Vittel. The thermal park and the golf course are leased out to Club Méditerranée, a private tour operator, under the condition that the grounds be maintained by Agrivair to ensure that ‘green practices’ are applied in the vicinity of Grande Source.

According to the Agrivair Director, the costs estimates by INRA are not correct and the analysis is inadequate since it focuses on the cost side of the programme while any meaningful analysis should compare the costs with the benefits of the programme. An even more useful analysis would compare the cost-benefit ratios between the Vittel programme and the public programmes also addressing similar water quality issues.

From Agrivair’s point of view, the profitability of such an investment is not in question but financial aspects are not the fundamental reasons why the programme succeeded. Obviously, Nestlé Waters’ ability to inject large amounts of money at the beginning of the programme was fundamental to getting it started. But the programme succeeded for reasons beyond financial ones.

In the long run, it is the profitability of the Vittel mineral water business – linked to its attractiveness on the market for bottled water and its ability to compete with other types of less expensive waters – which will determine the cost-effectiveness of this type of programme.

5.2 The primary reasons for success are not financial

In the opinion of the Agrivair Director, even with all the scientific knowledge accumulated, the programme would not have been possible without the effort made to understand farmers, establish a permanent dialogue with them, and recognise their perspectives – not only in terms of farming practices but also in terms of life choices. The methodology used in this process was the key to success, not the funds injected into the programme.

The entire programme was essentially a ‘learning-by-doing’ experiment and it was the ability to ‘think outside the box’ brought by the multidisciplinary INRA team (and later Agrivair), and the active participation of farmers in identifying and testing alternative practices, that brought success to the experience.

Understanding farmers’ choices and constraints (not only at the present time, but into the future) and – in contrast to the European Union – offering them long-term rather than yearly contracts (to reduce risk) were fundamental elements of success. Understanding the local reality from a development perspective, and not just from a technical perspective (‘farming practices’), was also key in identifying solutions that took into account farm families’ present and future plans. Reducing risk and uncertainty by offering subsidies high enough to ensure that there was no loss in revenue was another important element. INRA estimated that during the first five years, farmers subsidies were equivalent of up to 75% of farm disposable income (INRA 1997).

This case study also illustrates convincingly the fundamental role of intermediary institutions. INRA and then Agrivair played a key role in establishing trust between farmers and Vittel. The Director of Agrivair was formerly employed with the INRA research team working in the area and his knowledge of the farming community, as well as his ability to communicate

[5] Agrivair was also innovative and looked for solutions outside the conventional channels. For example it imported large-scale lawn mowing equipment from the United States to increase its efficiency in golf course maintenance.

scientific information to farmers, made him a particularly effective interlocutor. The geographical proximity of the Agrivair grounds and staff was also important as it provided a convenient meeting place to establish an ongoing dialogue. Eventually Agrivair and the farmers succeeded in reaching a mutually satisfactory arrangement. The research team contributed in determining the basis on which Agrivair would negotiate each contract with each individual farmer, as neither Agrivair nor the farmers knew which changes were necessary to reach the desired nitrate level.

The successful long-term partnership with a public research institution was also a key element of success. Without it, Agrivair would not have been able to develop the programme and validate recommended practices scientifically. There was at the time a “strong political support to make the experience successful, to a certain extent regardless of the overall costs” (Barbier 2004, cited in Déprés et al. 2005). Much was a stake not only for Nestlé Waters but also for the municipality, which benefited from the employment created by the business and the tax revenues.

The research team played a mediation and communication role that was fundamental in establishing trust and mutual comprehension of the technical issues. Understanding the land market and debt cycle in which farmers were caught as well as their financial risk, demonstrating that the same revenue could be achieved with different farming systems, and providing long-term solutions, were all fundamental to the success of the negotiation process. Agrivair essentially proposed changing practices in exchange for ensuring long-term continuity of farming and sustainability of farm family life in the basin.

Feasible solutions and clauses in the proposed contracts were elaborated through a collaborative process with farmers – which increased their acceptability. The programme was enthusiastically accepted by the Water Agency and the municipalities. However to this day, it has not been possible to achieve collaboration and mutual understanding with the Farming Union and the Chamber of Agriculture, which have a vested interest in maintaining the original production systems. Nevertheless, this did not prevent individual farmers and Agrivair reaching a mutually beneficial agreement.

In addition to leading negotiations and co-ordinating the design, implementation and monitoring of the programme, Agrivair has a fundamental role in empowering farmers to act: it provided them with technical, administrative and organisational support by linking them to the research community and to new social and professional networks and services (technical support, input providers). Farmers who decided to enter the programme lost their links with traditional farming networks (Chambers of Agriculture, Farmers’ Federation), and it was essential for the success of the programme to provide new support networks and enable farmers to enter a new professional group and not be dependent on Agrivair alone. The programme also provided political mediation between the different actors so that it could be publicly and openly debated by professional organisations. Agrivair provided a platform through which farmers could voice their concerns, doubts and questions, as well as share their experiences.

It also provided tailored technical advice to individual farmers and addressed the labour bottleneck by providing the labour necessary to implement the new farming practices (composting, and spread of composted manure). Agrivair maintains a staff of about 20, although not all are involved fulltime with farmers, and provides 23% of the overall seasonal work for each farm (Gafsi 1999, cited in Déprés et al. 2005). It is clearly filling a role without which the scheme would not have been possible.

The experience shows that generous financial incentives and scientific knowledge are far from sufficient to ensure the success and adoption of such a programme.

It also shows that imperfect knowledge does not limit the effectiveness of action. Although there was much uncertainty at the beginning, it was possible to simultaneously develop an understanding of the system and propose solutions while initiating a dialogue with the farming community. In fact, the research in farmers’ fields provided a platform to discuss the solutions proposed and encouraged open dialogue.

Figure 4: Hedgerows planted by Agrivair (Photo: D. Perrot-Maître)

The geographic proximity between actors was also important in establishing an ongoing dialogue and moving from conflict to co-operation. Had researchers spent little time on farmers’ fields, and had Agrivair been located away from Vittel, the interactions with farmers would have been different and a climate of mutual trust may not have been established.

The Vittel case study illustrates the difficulty in establishing PES. Agrivair had to go negotiate a series of legal, regulatory, social, technical, political and administrative hurdles before a successful partnership between Vittel and the farming community could be established

It also illustrates the complexity of technical issues: how to calculate individual payments and estimate opportunity costs, as well as political issues such as the importance of other actors in influencing the bargaining process, and the rivalry within the farming community.

The experience clearly illustrates that money alone cannot provide a sufficient incentive when systems are complex and risk to the farmers is high. Moreover, even when national policies and regulations are in contradiction with the proposed programme, it is still possible to achieve results.

To the question as to why the Water Agencies and the French Ministries of Environment and Agriculture are not able to obtain similar results when vast amounts of money are spent every year to improve water quality, Agrivair proposes this answer. First these institutions are dominated by a single scientific discipline (agronomy, plant science, livestock science, etc.) and offer technical solutions without addressing the economic, social, legal, political and communication aspects of change. Solutions and incentives tend to be short-term and do not take into account the livelihoods strategies of farm families and their long-term plans (including the future of family farming for the next generation). They do not start with the basic premises that in order to succeed, any change must ensure that agricultural revenues are maintained at all times, and that in the long run, social, political and technical support networks are fundamental elements of the farming systems and must also be considered throughout the process. Changing farming practices is as much a social and political change as a technical one.

Could such a programme be established if Vittel had not been purchased by Nestlé and had it remained a family business? In the case of Vittel, the answer is “No”. Not so much because of the capital needed but because the programme was initiated at a time when the bottled water market was being taken over by two or three corporations. Vittel, as a family enterprise, lacked the experience in international marketing to compete and could not survive without integrating into a large group. According to the Agrivair Director, if the business context had been more favourable, Vittel could have established a PES programme as long as it followed a similar methodology. Because it could invest fewer resources than a large corporation, the process would have probably taken more time but could have eventually succeeded – assuming that enough farms would have enrolled on time in the programme.

6. The business case for private sector participation in PES

Beyond the issue of whether it represents a perfect PES, the Vittel experience illustrates the fact that there is a business case for the participation of the private sector in payment for ecosystem services.

The participation of the private sector in PES has been so far sporadic and limited. For example the involvement of hydropower companies has been highly publicised in Costa Rica but the link to the provision of an ecosystem service is less than clear. Rojas and Aylward (2002) argue that the La Esperanza hydropower plant is actually paying an insurance premium to maintain access to the water rather than paying to ensure water quality through reduced soil erosion. Virginia Reyes, formerly a researcher at the National University at Heredia argues that the primary motive for payments from hydropower companies in Costa Rica is political. A number of international corporations such as Du Pont, Nestlé South Africa, Unilever etc are also investing in river basin management activities (Perrot-Maître 2004) but here also the link to ecosystem services is less than clear and building an image and a reputation seem to be their primary objectives.

A few other experiences are in their infancy, largely promoted by international environmental NGOs. Potential for improvement is great and encouraging changes are already occurring. The business community increasingly recognises the importance of ecosystem health to the competitiveness and sustainability of business operations and this is slowly being reflected in strategies and actions[6].

Vittel is but one example of how business can contribute to sustainable local development. The private sector has much to contribute in terms of financing PES but also, as illustrated by Vittel and Agrivair, in terms of know-how, capacity, financial and business administration, networking, and the establishment of public-private partnerships. Beyond specific cases such as Vittel, much can be done to increase the awareness and the participation of the business sector in payments for ecosystem services. This can include for example (Mulder et al. 2005):

- Strengthening regulatory incentives for private investment in ecosystem protection and restoration.
- Adapting the organisation of PES to national economic and institutional contexts.
- Providing information on short-, medium- and long-term direct and indirect benefits and business opportunities from investing in ecosystem services.

This will also imply using business's own language and communication style and developing a better understanding of business decision-making processes and rationale.

[6] See for example *Tomorrow's markets* (2002), a report of the World Business Council on Sustainable Development (WBCSD) and *Connecting the Drops Toward Creative Water Strategies* (2002), a report from the Global Environment Management Initiative (GEMI, 2002), a US-based organisation which provides a forum for leading companies dedicated to fostering global environment, health and safety excellence. The GEMI report is pointing out that the business case for strategically addressing water challenges is getting stronger as water-related costs and risks are growing. See also the *Ecosystems and Human Well-Being: Opportunities and Challenges for Business and Industry* report of the Millennium Ecosystem Assessment for the business community (2005) and the 'Ecosystem initiative' recently launched by WBCSD to explore further the role of markets and payments for ecosystem services and the opportunities for businesses (Haden, 2006).

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