



Session Title:

Making Community-Driven Networks a Reality

**From an Information System and Telecenter
Network Project to a Community Network:
Building Financial Sustainability through
Social Sustainability**

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Abstract

This paper presents the case of the Sistema de Información Agraria (Agrarian Information System, SIA) promoted by the NGO CEPES in the Huaral Valley of Peru. Initially a telecenter network and information system project, the SIA is developing into a kind of community network.

The Huaral Valley is on Peru's Pacific coast, 90 kilometers north of Lima. The majority of its population makes a living from agriculture, which entirely depends on irrigation. The organization of irrigation has traditionally been deeply socially imbedded in this and other coastal valleys. Today, water resource management and irrigation infrastructure are in the hands of small farmers' organizations: the Irrigation Board and local irrigation commissions.

The project developed by CEPES with the Irrigation Board involved the installation of telecenters in rural communities and the creation of a web-based information system on water management and cultivation monitoring. The project has one connection to the internet and a wireless network that connects telecenters and offices. This technology also makes it possible to provide telecommunications services, although there are regulation constraints.

The role of a local community-based organization in shaping the project, adapting it to a changing environment and putting pressure on policy-makers has been crucial in achieving success and sustainability.

1.0 Introduction

Telecenters, information systems and other ICT-for-development projects struggle for sustainability. Sustainability is often considered solely in financial or economic terms, but we would like to argue here for a more holistic conception that also considers social, cultural, technological, legal, political and organizational aspects.

This paper presents the case of the Sistema de Información Agraria (Agrarian Information System, SIA) promoted by the NGO CEPES in the Huaral Valley of Peru. As we will see, this project is becoming sustainable because of it is being appropriated and shaped by the local community-based organization with which it was developed.

Initially a telecenter network and information system project, the SIA is turning into a kind of community network. The WiFi technology used makes this possible, but there are policy and regulation barriers to be solved. Although this service provision capacity was initially viewed only as a financial sustainability strategy, it is developing into a part of the project.

We hope that the experience presented here can in some way contribute to enlightening practitioners about the importance of local organizations, the consideration of context, adapting to the local environment, and the opportunities offered by the community network concept.

2.0 The Huaral Valley Agrarian Information System

In 2000, a CEPES representative visited the local government in Aucallama to invite it to participate in a project aimed at using computers and the internet to improve its internal functioning and services. The local government was not interested in the project, but Marcial Vega – a member of the government and president of one of the local irrigation commissions – suggested working with the Irrigation Board.

Since 2001, CEPES and the Irrigation Board – with Vega as the new president – have been developing the project. Initially, the idea was to install one computer at every irrigation commission and connect them all to the internet with VSATs. The objective was to improve the administration of the commissions and provide irrigation users with agrarian information. Potential funders worried about the project's financial sustainability: the technology selected was too costly and there were no plans for any sort of income generation. The Red Científica Peruana (Peruvian Scientific Network, RCP) recommended using wireless technology to interconnect the commissions with one central point to access the internet, and to sell internet access service to schools. This last aspect was later changed to providing public access through telecenters, because of the difficulties in making arrangements with the education sector.

Thus the decision was made that the project would involve the creation of an agrarian information system using wireless technology to interconnect several points in the valley, with the following objectives: to contribute to ICT appropriation by farmers and the rest of the population; to improve the administration of the Irrigation Board; and to provide farmers with access to useful and appropriate information. It was also determined that the system should be financed by selling telecommunication services (limited at that point in time to providing internet access through telecenters).

ICTs were always understood as tools for development, tools that should be accommodated to the concrete context. This implies that, together with providing actual access to these tools, their application should involve community participation and ownership, and address capacity building and content issues.

2.1 Background

The Huaral Valley lies 90 kilometers north of the city of Lima, the capital of Peru. The valley includes the middle and lower sections of the Chancay River basin. It has a subtropical arid climate and its agricultural production relies on irrigation, as is the case along almost all of the Peruvian coast. Agriculture provides for the livelihood of the majority of its population. The valley encompasses three districts – Chancay, Huaral and Aucallama – that form part of the province of Huaral (which itself forms part of the region of Lima). Together with the district capitals – of which the city of Huaral is the largest – there are several small settlements that lack basic services such as roads and telecommunications.

The Peruvian agricultural sector is divided among small properties. The agrarian reform of the 1970s expropriated the lands of large landholders and distributed them to cooperatives formed by farm laborers or pre-existing peasant communities (Matos Mar 1980; Matos Mar 1984). The counter-reform process initiated in the 1980s led to the fragmentation of cooperatives, as cooperative members were given the possibility to become landowners. However, this fragmentation eliminated economies of scale, meaning lower income, obstacles for technical innovation, greater profits for intermediaries in the marketing of farm production, and less access to formal credit (Eguren 1988; Fernández and González 1990).

In Peru, farmers do not usually take weather forecasts or business opportunities into account to change their productive or commercial practices, and instead persist in doing things in the way they are most familiar with (Bossio 2002; Cancino 2001; INEI 1996). Those who actually change their practices use social networks to access the required information, while some rely on providers regarding technical issues.

2.1.1 Internet access

In the case of Peru, there are an enormous number of commercial public internet access points (PIAPs) known locally as *cabinas públicas*.¹ It is estimated that there are 20,000 to 30,000 *cabinas* for a population of 28 million people. They are the only point of access to the internet for around 70% of internet users. However, the immense majority of *cabinas* solely provide access, but no training or content development. Therefore, while the lack of access is being solved by urban entrepreneurs – it is not happening at the same pace in rural areas – there is a lack of appropriate content for different interest groups.

Before the project, the only *cabinas* in the Huaral Valley were in the city of Huaral and in Huando, a nearby town with an irrigation commission. Many public institutions, including all of those related to the agriculture sector, did not have access to the internet. This is why the project aimed to establish a telecenter network to provide connectivity to rural communities.

'Telecenters' does not mean the same for everyone. To some they are just another kind of PIAP, like cybercafés or libraries, because what is considered crucial is their capacity to provide access to the internet (Proenza 2001). The SIA project shares the idea of the community telecenter movement, which argues that telecenters are tools to be used for development purposes and not ends by themselves (Delgadillo et al. 2002; Gómez and Casadiego 2002; Stoll and Menou 2003). In this sense, telecenters take on the role of

¹ **Cabinas públicas** were promoted by the first Peruvian internet service provider (RCP) as means to provide access to people without internet access, at a reasonable (and accessible) price. Almost all of them are micro-enterprises.

intermediary and make ICTs usable by the poorest people. This intermediation includes creation and dissemination of knowledge or appropriate information, and development of local capabilities (Madon 2000).

2.2 The Irrigation Board

In Peru's coastal valleys, agriculture relies on irrigation, and its organization has always been firmly socially embedded. Before the agrarian reform, large landowners (*hacendados*) managed water resources using social relationships with highlands communities. After the reform, strong regulation was needed, and the government began managing this resource (Oré, 1989).

In 1979 new organizations were created for water management: Irrigation Users Boards in every 'irrigation district' (usually a river valley). These boards are responsible for maintaining irrigation infrastructure – mainly channels, sluice gates and reservoirs – and are financed by charging farmers for the irrigation infrastructure they use.

In Huaral the Irrigation Board is elected by representatives of 17 local irrigation commissions. There are officially 6,000 'irrigation users' in the district. It is important to clarify that only landowners registered with the board are counted in this figure, because farmers who rent land or agricultural laborers are not members of the commissions.

2.3 Description of the project

This section looks at the different actors and counterparts involved in the project, landmarks in the project implementation process, and project services.

2.3.1 Institutional actors related to the project

The most important actor for the project has been the Irrigation Board. An assembly made up of two delegates from every commission took the decision to participate in the project, and another resolved to buy 12 computers as an economic contribution to the project in 2002. In addition, of the 12 commissions with telecenters, one renovated its premises while another ten have bought or rented new ones: they did not have offices before the project, but now they do.

The project touches on three governmental sectors: telecommunications, agriculture and education. CEPES presented the project to the Telecommunications Investment Fund (FITEL) in 2001. It took more than three years to be approved, and in the interim certain regulation problems were solved (for instance, the use of digital linked radio equipment to interconnect the board and the commissions was previously not permitted). Agricultural sector institutions at the local and national level were always considered as key partners because of the information they have. The project also tried to engage the education sector, and obtained a commitment from local decision-makers (the Local Education Management Unit, UGEL). However, it proved impossible to actually implement an agreement because of bureaucratic problems, probably caused by a national internet-related education sector project (known as Huascarán).

The project directors wanted to include commercial agricultural enterprises from the outset, but these showed little interest. In 2005, a number of laboratories became associated as providers of technical information.

2.3.2 Implementation of the project

Work on the project began in 2001 with research on information needs (Cancino 2001). The design of the information system started in November 2002.

In 2003 CEPES obtained financing from the agricultural sector: the Ministry of Agriculture's Agrarian Research Department (DGIA) provided funding for 280 farmers to be trained in computer and internet use, and the INCAGRO project supported the development and first load of the agrarian information system (SIA).

In 2004, the content platform (<http://www.huaral.org>) was published, and finally, at the end of the year, the irrigation commissions and the Irrigation Board head office were connected to each other and to the internet.

2.3.3 Project services

The SIA project offers the following services:

- Interconnection between the 12 Huaral Valley irrigation commission information centers. In the last two months there were more than 2,000 minutes of phone calls within the network. The use of instant messaging and email services cannot be precisely measured, but they are intensively used by telecenter administrators, board officers and most irrigation commission leaders.
- An information system (YACU) for water resource management and cultivation monitoring.
- Access to the internet through 62 PCs at the telecenters using thin client technology and open-source software. This service is provided free of charge for farmers and their families to access agrarian information, and for USD 0.30 per hour for other uses.
- Telecenter administrators provide free agrarian information through web searches and a bulletin board, which is useful to give information to those who still do not feel comfortable using computers. Telecenters offer photocopy and scanner services, which were previously unavailable in most of these places.
- Internal VoIP telephony between information services in the valley using a server with locally developed free software that offers message service and others.
- Public telephony based on VoIP and wireless internet access (omnidirectional in one telecenter and point-to-point in others).

2.4 SIA, an Irrigation Board project

At the beginning CEPES was looking for an institution interested in developing a project for rural development using computers and the internet. Then the Irrigation Board got involved, and at some point in 2003, the project started to be considered a project of both institutions. Nowadays, it is the Irrigation Board's project which has built up momentum and continues to have the support of CEPES.

There has undoubtedly been a shift in the ownership of the project. This appropriation of the project by the Irrigation Board was encouraged by CEPES – as usually happens in most development projects – but it was the Board and its leaders that made the difference. It was the pressure exerted by the Board that speeded up decisions on funding in the

telecommunications and agricultural sectors; it was the Board that convinced laboratories and local agricultural sector offices to become information providers; it was the Board that supported the use of open-source software in the telecenters, something that had failed in almost every other ICT rural development project in Peru; and it is the Board that is shaping the project.

2.4.1 First impacts of the project

A mid-term evaluation was conducted in the first quarter of 2005 (Bossio and Rocha 2005), when internet service had only been in operation for a few months. The main impacts observed at that point were institutional strengthening of the Irrigation Board, improved internal and external communication flows, improved administrative functioning of the Board and commissions, and improved telecommunication access in the Valley. The evaluation stressed the following impacts:

- The Board had a new 1,650 m² office, it had doubled its water storage capacity, and it was leading an up information project considered an example in Peru and beyond. It was becoming “the most important institution in the valley,” according to its vice president, and was gaining leadership status among Irrigation Boards across the country.
- Better communication was considered an important change by leaders and personnel at the Board and the commissions because internal telephones and internet permitted them to have communication that was previously unavailable in some cases or expensive in the rest.
- Connectivity between commissions and the Board central office helped to improve mechanisms for the collection of irrigation infrastructure tariffs, information exchange between Board technical officers, risk management of irrigation infrastructure, and water distribution planning.
- In 10 of the 11 localities with a telecenter there had been no internet access before the project. In one of the communities, there were not even any public phones before the project. The project also promotes private sector internet access initiatives, because after a few months of implementation there were new *cabinas* in five of the localities. In addition, the experience of using WiFi had influenced an increase in these kinds of connections along the entire coast, although this is hard to precisely measure.
- Considering that the internet had only been working for a few months at the time of the evaluation, the researchers did not expect to observe much of an impact from internet usage. However, some impact was observed. For instance, some commissions had set up websites to enhance their leaders’ accountability, and a number of farmers had gone to the telecenters to get commercial information on products, pesticides and fertilizers.

2.4.2 Board preferences: irrigation information system and telephony services

The project objective was to give farmers access to productive and commercial information that they could use to make decisions. While that is still one of the project’s objectives, Board leaders have come to place greater importance on other aspects. One is their own information system on water availability and the kind of agriculture products being served, and the other is telephony service.

IP telephony was initially a secondary service that was permitted by the infrastructure installed. At the beginning there was only internal telephony between commissions and the Board office. Then it was possible to make phone calls from commissions without phone service using the Board office line. Since the system made it possible to charge the commission and individual users for phone service, it was opened to the general public, but regulatory constraints have made it impossible to continue providing this service.

The Irrigation Board and CEPES have been working on regulatory alternatives with telecommunications officials, but they have not found a solution yet.

2.4.3 Growth, dreams and plans

The Board leaders want to scale up the project within Huaral and throughout the Peruvian coast. In the Huaral Valley, they would like to install telecenters in all the currently unserved irrigation commissions (six) and expand the services offered (with more computers, for example) in those that already have telecenters, especially in communities not served by private *cabinas*. They want also to help other Boards to replicate the project in the entire coastal region and mainly in the rest of the valleys around Lima – firstly, because their product's value is defined by the combined demand of valleys around Lima, and secondly, because they feel so proud of contributing in such a way from Huaral.

2.4.4 Project sustainability

'Sustainability' is used to describe the capacity of a project or its results to continue existing or working when funding or the external agent's presence ends (Fukao 2004). This capacity to continue existing has been reduced to financial terms by many development actors. However, sustainability also includes social and cultural, technological, political and legal, and organizational aspects (Delgadillo et al. 2002; Stoll and Menou 2003; Fukao 2004). All these aspects should be considered in order to achieve the continuity of actions and results of development projects, and more importantly, to avoid affecting the future development of communities.

Social and cultural sustainability are obtained through the participation of the community and community-based organizations; the commitment of local NGOs and other institutions; understanding of local characteristics, culture and traditions; consideration of differences within communities (gender, culture, age, etc.); the empowerment of marginalized groups; and empathy with local people (Delgadillo 2004). They are achieved when project results are appropriated by the community as a common good. The Irrigation Board guarantees social sustainability through its sense of ownership of the project.

Technological sustainability refers to the capacity to update technologies in future scenarios. In this case, technological sustainability seems to be solidly founded on the selection of open-source software (accepted and defended by Board leaders and telecenter operators) and linked radio, because these technologies are scalable and updatable.

Legal and/or political sustainability refers to the regulatory framework and acceptance by local policy-makers and political authorities, because a project cannot be successful if it is illegal. Some legal problems faced by the project were solved, while there are still regulation obstacles to be overcome.

Organizational sustainability is related to the local capacity to run the services developed and capacity building of local people to replace those who will leave the project. This sustainability is being nurtured by permanent training of telecenter operators, as well as a group of young people who could replace any of the operators who decide to leave Huaral.

These young women and men are the daughters and sons of farmers who are members of the commissions where they work.

Experience has shown that political, technical and social sustainability help to achieve financial sustainability, while the reverse has not been observed (Fukao 2004; Stoll and Menou 2003).

The Board's directors have guaranteed financial sustainability. At first they took part of their budget – which is supposed to be entirely devoted to irrigation infrastructure maintenance – to pay for telecenter administrators' salaries and internet connection. Now they have included an SIA fee in farmers' annual contributions. The SIA – with or without the telecenter services – has become an intrinsic part of the irrigation organization's functioning, because irrigation management is now computer and internet facilitated, and cannot revert to files and papers. The sustainability of the project resides there.

In addition, telecenters and the wireless network produce some side income which serves to pay for internet connection. There are big differences between the various telecenters, however, because some of them are in localities which already have *cabinas*, and others are in poorer communities. The provision of telecommunications services – public telephony and wireless internet connection – has been identified as an alternative to generate income.

2.5 Towards a community network

Rural areas have traditionally been underserved in numerous aspects, including telecommunications. They are unattractive to private providers or the public sector because of perceptions of high installation costs and the limited purchasing power of people in these areas. Providers face other, less talked-about obstacles: the lack of charging mechanisms applicable to rural areas, the lack of organizational flexibility, centralized technical teams, and technology dependence. In sum, they lack the capacity to adapt their general practices to the local context of small communities.

The community network has arisen as an alternative model to overcome those obstacles (O Siochrú and Girard 2005). Community networks or microtelcos are non-traditional local-scale organizations that deploy and operate ICT networks in places with unattractive markets for traditional operators. They can sometimes be hybrids of small-scale entrepreneurship, local government action and community participation. "What distinguishes them from traditional operators is the local scale, the use of low cost technologies and innovative business models, and the strong community links" (Galperin and Girard 2007, p. 96).

Community networks can 'leapfrog' in technology and test or combine different technologies, rely on confidence with local people, get support from local authorities, and develop local capacities to manage the network.

However, in order to operate community networks, there is a need for enabling regulatory frameworks. As Galperin and Girard (2007) suggest, such a framework should provide spectrum access, facilitate licensing, be technologically neutral, make universal service funds accessible for community networks or microtelcos, and provide guidance and a framework for interconnection arrangements between new entrants and the incumbent.

'Pro-poor pro-market' policies are needed so that that local entrepreneurs – with the support and contributions of local governments and communities – can offer the services that big providers refuse to give (Galperin and Mariscal 2007).

2.5.1 'Community network' type services provided by SIA

It is technically possible to provide VoIP telephony from telecenters, and there are three conventional telephone lines installed at the Board office through which VoIP calls enter into the public network. A system was developed to allow using prepaid cards to make phone calls from telecenters.

But in the case of Peru we still lack an enabling framework, as Saravia (2005) has pointed out. There have been policy guidelines to promote access to telecommunication services in rural areas (MTC 2003) and in the last year, the possibility was opened to be an 'independent operator' and provide telephony services in underserved localities. However, this is only possible if there is currently no available public phone – regardless of the quality of its service – and this is not the case for several of the localities with telecenters in Huaral. As a result, public telephony service is provided in an 'informal' way but cannot be opened up and massively provided despite the great demand.

The project provides wireless internet access to eight clients (four public institutions and four small enterprises). There is significant demand from schools as well. New users must make an important investment to start using the internet since these connections should be point to point, because of the kind of antenna that telecenters have. The income from this service would cover the cost of internet connectivity for the whole project, but there are delays in payment.

2.5.2 The future

There are plans to include GIS functionalities to the YACU system in the near future. Information from YACU will also be podcasted through local radio stations, and farmers will have access to these programs at the telecenters (customized radio).

The use of smartphones will be tested with a small group of farmers who will receive customized information. This research project will install three hotspots in the valley. This infrastructure will also provide internet to new telecenters in smaller communities, as well as local institutions and private users who can enter the network without a big initial investment. Thus, the SIA project is developing into a community network, and will soon be expanding its telecommunications services.

3.0 Conclusions

The analysis of this case shows that social sustainability is critical to achieve financial sustainability by providing funds and, more importantly, by proposing appropriate modifications that help to generate revenues by solving local needs. This leads to the point of determining the evolution from a telecenter and agrarian information system project to an amalgam that includes community network.

Telecenters installed in small rural localities have shown that there is room for private PIAPs (*cabinas*), so local small entrepreneurs are now investing in providing this service. The project has also shown that WiFi is an affordable and appropriate technology to provide internet access in the Peruvian coastal region.

The lack of adequate regulation continues to be an obstacle to the development of community networks, but the involvement of community-based organizations opens up the possibility to influence policy-makers.

The Board still needs to develop an appropriate business model in order to maintain and enlarge the network. It should include the engagement of other local institutions, NGOs, small enterprises and community organizations.

It should also explore if it would be better to separate the community network services as a non-profit organization because of regulatory, tax-related, administrative and representativeness reasons.

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