La Bienvenida: a Model Project

Introduction.

Agua Para La Vida normally carries out between 3 and 6 direly needed projects a year. A project comes up for funding after
- A community request has been received.
- An initial inquiry has revealed the likelihood that it is technically possible.
- The community has organized itself wholeheartedly to be able to become the communal owner of the project and to share equally in the construction tasks.
- We have carried out a detailed design and budget.

This means that substantial time is required between the initial request by the village and the funding request. For instance in the second step above, the evaluation of the springs can only take place during the height of the dry season, typically April or May. Any request for a new project later in the year can only be relayed to possible donors late during the next year.

On the other hand there is also normally an appreciable delay between the request for and the granting of funds. Grants givers usually have Boards that meet at fixed time intervals and often have submission deadlines. Individual and group donors may have to gather their resources through special events. All these donors naturally want to know in detail how their gifts or investments will be used and so they will await the specifics of a given project before deciding whether it is worth their support. An additional difficulty we encounter is that we have either to propose the same project to more than one funding source or wait for one of these funding sources to turn down the particular project to submit it to another.

Now Agua Para La Vida which has collaborated with more than 50 communities in the completion of their drinking water projects and designed many others, operates according to norms that have stood the test of time and that are explicit so that one’s curiosity about the detailed nature of a project can to a large extent be satisfied by the combination of these norms and of the statistics of costs from previous projects.

Hence the idea of a model project: we hope that a number of questions about any given project can be answered by the model project after it is realized that all projects undertaken are made to fit the mold.
Naturally there will be variations in costs. These arise either because the spring is unusually distant, or unusually low (necessitating larger diameter piping), or because the community is unusually dispersed, (more expensive distribution system), or because it is so remote that transportation costs are high. Some of these variations on the theme are discussed specifically later.

What follows now is:

A) How we proceed.
B) The choice and characterization of a model project
C) The budget of the model project.
Comments about factors affecting costs.

A) How we proceed: (See APLV document: Socio-Administrative and Educational Work associated with Water Projects, 2006).

The original investigation following the village request involves on the APLV side one or more project technicians, the reforestation technician, the two social workers and the technician who serves as contact and organizer for the duration of the project; on the village side several members of a water committee that temporarily represents the village.

The spring outflow is measured and the village committee is instructed in the measuring method and will continue to measure it once a week in order to determine the minimum flow rate. The dimensions of the system are coarsely determined (length of the conduction line and of the branches of the distribution network). These will serve as a basis for an estimation of the total number of required man-days of work. The ownership of the spring, of its watershed and of the land that the piping will cross is determined and negotiations are entered immediately to find out if the transfer of the spring to the village, the physical control of the watershed and the rights of passage underground of the necessary conduits can be secured. The contact technician and the social workers jointly establish a census, characterize the socio-economic and hygiene conditions of the village, and sensitize the population to the health benefits of a drinking water system. The latter is necessary because the link between health and potable water is often far from obvious to the campesinos and because a condition for the success of a project is the quasi unanimous support by the village population of the project and of its demands.

The following period involves field work (e.g. detailed surveying), multiple contacts with the community aiming at consulting it about its wishes, helping it develop the village governance required for the success of this communal undertaking and initiating a hygiene education program both in the school and in the homes. These contacts take the form both of village reunions and of visits to individual homes. Every family is asked to sign a specific work agreement. The village is required to elect both a temporary work committee (monitoring villagers' participation) and a permanent maintenance committee that will be trained during the length of the construction phase and that will collect periodically a small maintenance contribution from each family.
The detailed design and budget is then generated in Rio Blanco by APLV’s technicians. It is after this stage that the decision to proceed or not with the project is taken. If it is, projections and time tables are made and progress reports are sent periodically to APLV headquarters and relayed to the project sponsors.

Construction.

The construction is supervised by APLV’s Nicaraguan technicians and ETAP students. Spring capture and protection, and holding tank construction are carried out by specialized APLV masons who also demonstrate to the residents on one sample the construction of water stands and latrines. All other construction tasks are the responsibility of the villagers.

When the project is completed, a final phase involves a comparison between:

- The detailed performance predictions made as part of the design and measured performance, (quality and quantity of water delivered). This, jointly by APLV and the village water committee.
- The budget and actual expenditures.

After a period of observation the system is then formally turned over to the community.

B) Characterization of the model project La Bienvenida:

From among past projects which serve a range between 100 and 1600 inhabitants we choose a composite and fictitious one called La Bienvenida, whose present population is 245 and that is expected to grow at the rate of 3.5% per year to 410 inhabitants in 15 years. (though our projections of population growth have frequently been inaccurate). They occupy at present 42 houses. Their present sources of water are unimproved heavily contaminated wells and a small equally contaminated stream. The village is engaged in subsistence farming and a few of the families own some heads of cattle. The community has one grammar school and two “capillas” one catholic and one “evangelica” (protestant). There is no electricity. There are no usable latrines. Access is limited to a 6 kms “trocha” (unimproved trail) between a dirt road and the community. The trocha is practicable by powered vehicles only during the dry months (occasionally in November and December and from February to May). It is 2 ½ hours by pick up from Rio Blanco.

A spring is found 3.5 kms from the village and 48 meters above its highest houses. Its minimum flow rate is measured as 0.55 liters per second which is found to be 50 % more than the anticipated needs of the community 15 years hence with a water stand for each house. This margin is deemed satisfactory. So the community is given the option of individual rather than public water stands. While that option requires families to pay for part of the additional expense of individual “puestos” the village favors it. A suitable site for the distribution tank is chosen near the village and 40 meters below the spring. The trench network from the tank to the water stands turns out to be 1600m long.
The work required of the beneficiaries is calculated from the data (and announced to the villagers) as 1700 man-days.

The Agua Para La Vida norms then dictate the basic parameters of the design: For instance the water allocation to each inhabitant is 70 liters per day +a 10% waste or loss if the water stands are private, 40 liters per day+ 10% waste if they are public. The population must be able to use 50% of their allocated water during the first 2 hours of the day’s use. During the rainy season the inhabitants are encouraged to use more water which leads to a minimum capacity for the conduction line to the tank. These two requirements also fix the useful volume of the tank. For our example that volume is 10 cubic meters.

The design of the conduction line from spring to distribution tank is carried out with the help of an APLV-created software to give precisely the desired maximum flow rate. The software program includes provisions which prevent air from blocking or diminishing water supply to the tank when the spring output falls short of the maximum flow rate allowed.

The design of the distribution network is carried out through another APLV-conceived software program that guaranties both minimum pipe costs and satisfactory operation of all faucets under all scenarios encompassed by the norms. These two software programs are distinguishing features of APLV’s operation.

C) Project La Bienvenida’s budget

The costs presented in a table below have been calculated on the basis of both the physical characteristics of the project and of previous projects statistics.

For instance:

- The cost of the conduction line takes into account its length, its slope and its maximum flow rate.
- The cost of the tank is calculated as a function of its capacity.
- The cost of the distribution network is also calculated as a function of its physical characteristics.
- The transportation cost is the recent cost per truckload to a location similar to that assumed for La Bienvenida multiplied by the estimated number of truckloads required for the project. Here note that when a project is located in the vicinity of a substantial river the villagers often manage to obtain sand from the riverbed and also at the cost of large expenditure of time and effort generate the gravel required for the concrete by breaking riverbed rocks, both of which can cut in two the total transportation cost.
- The charge for salaries and expenses of the technical personnel (for design, field work, training, construction supervision) is estimated on the basis of past experience.
Naturally for another project the costs may differ substantially. But the population of the community, and its other main characteristics defining project costs are reasonably representative of one of our medium-sized projects.

Some guidelines for other projects:

- For both the conduction line and the distribution network the cost increase somewhat less than proportionately with the population, more than proportionately with the total length of piping and decrease less than proportionately with (as about the square root of) the level differences (for the conduction, between the spring and the tank, for the distribution network between the tank and the highest water stand).
- The tank cost increases somewhat less than proportionately with the population.
- The part of the extra cost of private water stands over public ones not reimbursed by the villagers is about 35%.
- The cost of truck transport increases sharply (figure difficult to specify in general) with village remoteness.
- Technical personnel cost increases less than proportionately with population and with total length of piping.
### Budget of the Water Project: La Bienvenida

<table>
<thead>
<tr>
<th>I. WATER SYSTEM</th>
<th>II. LATRINES</th>
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<tbody>
<tr>
<td><strong>A) Construction Materiel</strong></td>
<td><strong>Material and Transportation</strong></td>
</tr>
<tr>
<td>1) Spring capture</td>
<td>$140 \times 42</td>
</tr>
<tr>
<td>2) Conduction line</td>
<td>$1,826.00</td>
</tr>
<tr>
<td>3) Holding tank</td>
<td>$1,920.00</td>
</tr>
<tr>
<td>4) Distribution network</td>
<td>$1,344.00</td>
</tr>
<tr>
<td>5) Waste water drainage</td>
<td>$656.00</td>
</tr>
<tr>
<td>6) 1 bridge for conduction line</td>
<td>$440.00</td>
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</tbody>
</table>

**Construction material total**: $6,396.00  
**Sales tax, 15%**: $959.40  
**Total material purchase cost**: $7,355.40

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<tr>
<th><strong>B) Material transportation</strong></th>
<th><strong>Water System</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C) Salary and expenses of specialized mason</strong></td>
<td><strong>Technical Personnel</strong></td>
</tr>
<tr>
<td>$3,446.00</td>
<td>$11,608.00</td>
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<tr>
<td>$807.00</td>
<td>$3,900.00</td>
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</tbody>
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**Total Direct construction costs**: $11,608.40  
**Total project cost**: $21,388.00