FORWARD

The following report was prepared for the Project Management Unit of the Cao Bang-Bac Kan Rural Development Project (CBBCRDP) by an independent consultant who was invited to review the Project’s irrigation programme.

This report presents the consultant’s initial findings during a field visit undertaken in September, 2002. The consultant’s work will be completed during a further field visit to be undertaken in April, 2003.

The views expressed and conclusions reached herein are not necessarily the views and conclusions of the PMU, the European Union or the Ministry of Agriculture and Rural Development.
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<thead>
<tr>
<th>Abbr.</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACO</td>
<td>Agricultural Cooperation</td>
</tr>
<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
</tr>
<tr>
<td>ADO</td>
<td>Agricultural District Officer</td>
</tr>
<tr>
<td>BT</td>
<td>Bach Thong District (Bac Kan)</td>
</tr>
<tr>
<td>CBBCRDP</td>
<td>Cao Bang Bac Can Rural Development Project</td>
</tr>
<tr>
<td>CPC</td>
<td>Commune People’s Committee (CP Council is always written in full)</td>
</tr>
<tr>
<td>CWE</td>
<td>Centre for Water and Environment</td>
</tr>
<tr>
<td>DARD</td>
<td>Department of Agriculture and Rural Development</td>
</tr>
<tr>
<td>DPC</td>
<td>District People’s Council</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>GoV</td>
<td>Government of Vietnam</td>
</tr>
<tr>
<td>GWP</td>
<td>Global Work Plan</td>
</tr>
<tr>
<td>Ha</td>
<td>Hectare</td>
</tr>
<tr>
<td>Hh</td>
<td>Household</td>
</tr>
<tr>
<td>HL</td>
<td>Ha Lang District</td>
</tr>
<tr>
<td>IMC</td>
<td>Irrigation Management Company (under DARD)</td>
</tr>
<tr>
<td>lps(pha)</td>
<td>Liter per second (per hectare)</td>
</tr>
<tr>
<td>MARD</td>
<td>Ministry of Agriculture and Rural Development</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>Operation and Maintenance</td>
</tr>
<tr>
<td>PMU</td>
<td>Project Management Unit</td>
</tr>
<tr>
<td>PPC</td>
<td>Provincial People’s Council</td>
</tr>
<tr>
<td>Q</td>
<td>Discharge (volume unit per time unit, e.g. lps, cubic meter per month, etc.)</td>
</tr>
<tr>
<td>RCC</td>
<td>Reinforced Concrete</td>
</tr>
<tr>
<td>SLLC</td>
<td>Son La Lai Chai</td>
</tr>
<tr>
<td>SLLCRDP</td>
<td>Son La Lai Chai Rural Development Project</td>
</tr>
<tr>
<td>SPOF</td>
<td>Sub Project Outline Form</td>
</tr>
<tr>
<td>TN</td>
<td>Thong Nong District</td>
</tr>
<tr>
<td>ToR</td>
<td>Terms of Reference</td>
</tr>
<tr>
<td>VND</td>
<td>Vietnamese Dong</td>
</tr>
<tr>
<td>WUA</td>
<td>Water Users Association</td>
</tr>
</tbody>
</table>
1 Introduction

This mission took place from 1 August to 10th of October. The Terms of Reference (ToR) has been given in Annex 1. The itinerary can be found in Annex 2.

The Terms of Reference of the mission gives a technical review and support to the programme for Operation and Maintenance (O&M) of Cao Bang Bac Can Rural Development Project (CBBCRDP) as the two main objectives.

Firstly, a review will be undertaken of the irrigation programme, sub-project justification and designs. This preliminary review will be a first attempt at starting to learn lessons for future programmes and interventions. This will contribute to what ultimately should become the irrigation component chapters of the Final Report.

The outputs as per ToR would be:

1. A sub-project justification review
2. Measurable sub-project evaluation indicators
3. Scheme design review: benefit delivery, technical adequacy, long-term economics, maintenance, manageability and sustainability.

Comments: Sub-project justification and design review on various aspects will basically cover the whole irrigation programme, its objectives, approach and activities, as these are all narrowly interwoven. Details on specific sub-projects are used as examples.

For the purpose a series of sub-projects has been visited and a number of designs scrutinised. Discussions were held with beneficiaries, Commune officials, contractors, supervision staff, government officials and project staff. The list of visited projects and details of scrutiny has been attached as Annex 3. Locations are further shown in the maps of Annexes 4 and 5.

Secondly, this mission is to support the formation and capacity building of Water User Associations (WUA). It attempts to analyse the problems at hand, study and discuss the proposed programme to be undertaken by the contracted party (CWE, Centre for Water and Environment) and to advise CWE and the programme on O&M affairs.

The outputs will be:

1. Inputs in outline plans and strategies for WUA establishment and training programme
2. Participate in review of support agency, institutional arrangements and strengthening needs
3. Input in ToR for WUA programme consultants
4. Ensure integration of gender issues
5. Assist in negotiations for the appointment of WUA programme consultants

Comments: At the time of the mission start the Terms of Reference, draft consultant proposal and draft contract had already been drawn. An input in drafting a ToR (3.) and assistance to negotiations with consultants (5.) was therefore not possible. Even if it had been feasible to provide comments and to propose changes immediately upon arrival, these would mostly not have been possible to incorporate. As it was, even in hindsight at the end of the mission, there was not much reason for proposing changes. The proposal by the consultant was based on experiences in similar programmes that involved the same parties (villagers, Communes, Department of Agriculture and Rural Development (DARD)) and appeared sound for the circumstances of CBBCRDP, too. The process-like approach allows for adjustments along the way and is geared to maximum ownership by DARD.

An input in drafting outline plans and strategies (1.) and the review (2.) would have also to be small by nature as these will be done during the process by DARD and CBBCRDP’s Project Management Unit (PMU) themselves. The input will be further reduced by the fact that the process will actually only start in October after the end of this mission.
So, this mission will be less a driving force for the programme than envisaged in the terms of reference. This is fortunate, as now the actual initiative rests with CWE, PMU and DARD. In style this report will list issues and provide supporting comments and suggestions to each of the consultants’ WUA-support programme components. For the purpose a review of O&M practices and problems has been compiled. Models used elsewhere have been compared. This overview should support PMU, CWE and DARD when they are assisting WUAs to establish and shape themselves.

2 The Irrigation Component

Irrigation is one of the three infrastructure components, beside watersupply and roads. The infrastructure again is one of the three programme components, beside agriculture and forestry. The irrigation component’s Immediate Objectives/Indicators as mentioned in the Global Work Plan (GWP) and general achievements are given below. Objectives are given in more detail and with comments in Annex 7.

Table 1 Immediate Objectives and Achievements

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Upgraded schemes (Fig.1 C)</td>
<td>90+ upgraded schemes</td>
</tr>
<tr>
<td>2. Reduced water losses (Fig.1 D)</td>
<td>90+ schemes with reduced water losses</td>
</tr>
<tr>
<td>3. Improved water management (Fig.1 B)</td>
<td>Not sure what is meant in Appraisal Report/GWP</td>
</tr>
<tr>
<td>4. User consultation process (Fig.1 C)</td>
<td>Users have been consulted. No details.</td>
</tr>
<tr>
<td>5. Farmer associations trained (Fig.1 A)</td>
<td>Will be done in 2002-2003</td>
</tr>
<tr>
<td>6. Water User Groups set up (Fig.1 A)</td>
<td>Will be done in 2002-2003</td>
</tr>
</tbody>
</table>

If we look at the structure of objectives then it would look much as the sketch presented in Figure 1.

Figure 1 Structure of Objectives

Any layer in this structure will not be possible for any long time (be sustainable) without a sound layer beneath it. And any layer, except layer F, has no function if it does not have a layer above to support. CBBCRDP works with 90+ existing schemes in which such objective structure already exists. As it intervenes in these schemes the contents of each layer will change drastically as well as the relations among the various layers and the whole structure. The activities related to each layer will therefore need to be done cautiously and not without looking at the other layers. An attempt to visualize what CBBCRDP will change in existing systems is made in Table 2.
Table 2  The Changes that CBBCRDP Brings

<table>
<thead>
<tr>
<th></th>
<th>Normal Systems</th>
<th>CBBCRDP Upgraded Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>F: Food, income</td>
<td>Most people have enough food</td>
<td>All have enough food</td>
</tr>
<tr>
<td></td>
<td>Few have not enough food</td>
<td>Most have more food to sell</td>
</tr>
<tr>
<td></td>
<td>Many can sell food</td>
<td></td>
</tr>
<tr>
<td>E: Area, yield, seasons</td>
<td>Most systems are between 10 and 30ha, and have one rice crop of 2.5 to 4 T/ha</td>
<td>Summer area increase: 100% =&gt; 110%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spring area: 110% =&gt; 150% area</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yield increase: 10% for summer/spring</td>
</tr>
<tr>
<td>D: Water availability</td>
<td>Most systems: enough for summer</td>
<td>All systems: enough for summer crop</td>
</tr>
<tr>
<td></td>
<td>Few systems: enough for whole year</td>
<td>Many systems: enough for whole year</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Many schemes: partly enough for spring</td>
</tr>
<tr>
<td>C: Irrigation system</td>
<td>Boulder dams and earthen canals</td>
<td>Concrete dams and concrete canals</td>
</tr>
<tr>
<td>B: O&amp;M</td>
<td>Dam repair: 0-5x/year</td>
<td>Dam repair: 0-2x in 15 years</td>
</tr>
<tr>
<td></td>
<td>Canal desilting/cleaning: 2x/year</td>
<td>Canal desilting/cleaning: 2x/year</td>
</tr>
<tr>
<td></td>
<td>Canal repair: simple, by irrigators</td>
<td>Canal repair: less frequent repairs, but more</td>
</tr>
<tr>
<td></td>
<td></td>
<td>difficult, expensive and slow</td>
</tr>
<tr>
<td>A.1: Organisation</td>
<td>Village under Village Headman runs the canal.</td>
<td>Tasks increase, more organization &amp; specialization is</td>
</tr>
<tr>
<td></td>
<td></td>
<td>needed, e.g. accountant, operators</td>
</tr>
<tr>
<td>A.2: Skills</td>
<td>Skills are in earthwork, rubble masonry and management</td>
<td>New skills are needed: RCC, cement masonry, accounts,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>fee collection, motivation, complex management</td>
</tr>
<tr>
<td>A.3 Funds</td>
<td>No money is involved</td>
<td>Money is needed for materials, skilled labour, DARD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>support</td>
</tr>
<tr>
<td>A.4: DARD/GoV Support</td>
<td>There is no financial or support relation with DARD or</td>
<td>DARD/GoV are needed for training, advice, aid with</td>
</tr>
<tr>
<td></td>
<td>government</td>
<td>big repairs, replacement/rehabilitation</td>
</tr>
</tbody>
</table>

The project is making much progress on the upper floors C, D, E, and F of this structure. Work on the lower floor B and the foundation A will be started last. Although it would be sound engineering practice to make the operation and maintenance feasibility and limitations the basis for engineering design, this is generally not done. Not in most parts of Vietnam nor in many other parts of the world.

The first part of the ToR is basically the preliminary review of the achievements so far on the upper floors. This is given in chapter 3, with an introduction to alternative ways to achieve similar or higher achievements in chapter 4. The second ToR part, the attempt to assist in work on the foundations, is given in chapter 5.
3 Review of the Irrigation Component

3.1 Improved Irrigation Systems (C)

3.1.1 Outputs
The Global Work Plan quotes DARD figures for the two Provinces of 11,000 micro-schemes locally built by the more hungry sector of population in remote locations, and used for subsistence farming. Some 35,000ha are irrigated in the two Provinces and DARD in 1997 estimated that 7000ha might be added to that. The Financial Agreement states the project would in total improve 230 schemes with a coverage of 7000ha. Later this figure was brought down to 3500ha. Ultimately the project is on its way to complete 90-100 schemes that will irrigate more than 1600ha.

The details for each scheme are given in the Sub-Project information table in Annex 6. The locations are given in the Cao Bang and Bac Kan maps of Annexes 4 and 5. Also the visited areas are indicated there. Table 3 below summarises Annex 6 by showing the totals per district. The project builds 136 kilometers concrete canal that serve more than 1600ha and more than 3900 households. The cost is 50 billion Vietnamese Dong, i.e. 3.4 million Euro.

<table>
<thead>
<tr>
<th>District</th>
<th>Canal (m)</th>
<th>ha</th>
<th>Hh</th>
<th>Cost</th>
<th>Cost (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bao Lac</td>
<td>35,330</td>
<td>444</td>
<td>830</td>
<td>12,212,966,129</td>
<td>814,198</td>
</tr>
<tr>
<td>Bao Lam</td>
<td>13,325</td>
<td>157</td>
<td>273</td>
<td>5,388,097,194</td>
<td>359,206</td>
</tr>
<tr>
<td>Ha Lang</td>
<td>22,498</td>
<td>391</td>
<td>874</td>
<td>11,125,973,894</td>
<td>741,732</td>
</tr>
<tr>
<td>N.Binh</td>
<td>13,200</td>
<td>158</td>
<td>370</td>
<td>6,220,200,000</td>
<td>414,680</td>
</tr>
<tr>
<td>T.Nong</td>
<td>32,450</td>
<td>256</td>
<td>866</td>
<td>8,294,400,000</td>
<td>552,960</td>
</tr>
<tr>
<td>CAO BANG</td>
<td>116,803</td>
<td>1,406</td>
<td>3,213</td>
<td>43,241,637,217</td>
<td>2,882,776</td>
</tr>
<tr>
<td>B.Thong</td>
<td>2,814</td>
<td>76</td>
<td>181</td>
<td>1,425,524,918</td>
<td>95,035</td>
</tr>
<tr>
<td>Na Ri</td>
<td>2,992</td>
<td>19</td>
<td>65</td>
<td>1,580,750,661</td>
<td>105,383</td>
</tr>
<tr>
<td>Ngan Son</td>
<td>13,713</td>
<td>157</td>
<td>446</td>
<td>4,481,330,079</td>
<td>298,755</td>
</tr>
<tr>
<td>BAC KAN</td>
<td>19,519</td>
<td>252</td>
<td>692</td>
<td>7,487,605,658</td>
<td>499,174</td>
</tr>
<tr>
<td>CBBCRDP</td>
<td>136,322</td>
<td>1,658</td>
<td>3,905</td>
<td>50,729,242,875</td>
<td>3,381,950</td>
</tr>
</tbody>
</table>

Table 4 shows the sub-project averages per district. The average scheme is 18 ha, serves 42 households and costs VND 570 million (£ 37,000), i.e. £2,000 per ha. Across projects the costs vary from £343 to 4266, with 10% below £1000/ha and 10% above £3300. It should be noted that the picture is slightly distorted by the fact that the costs of some projects is artificially low because the costs of weirs recently installed by DARD at own costs were not included. After updates of the infrastructure section database, it will be possible to differentiate between projects.

From the table it is obvious that there is little difference between the districts. Only Bach Thong and Na Ri in Bac Kan seem to vary, which might be attributed to the low number of schemes on which the average is based. Bach Thong is moreover a district that is less poor and remote and has been left out by CBBCRDP since. It is a good example for the consequences of the project’s policy to target poor districts. The other districts have all smaller and more expensive schemes.
Table 4  Irrigation Component Output, AVERAGES

<table>
<thead>
<tr>
<th>District</th>
<th>No.</th>
<th>Length</th>
<th>ha</th>
<th>hh</th>
<th>hh/ha</th>
<th>Cost/ha</th>
<th>Cost/hh</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bao Lac</td>
<td>23</td>
<td>1,536</td>
<td>19</td>
<td>36</td>
<td>1.9</td>
<td>1,834</td>
<td>981</td>
<td>35,400</td>
</tr>
<tr>
<td>Bao Lam</td>
<td>9</td>
<td>1,481</td>
<td>17</td>
<td>30</td>
<td>1.7</td>
<td>2,288</td>
<td>1,316</td>
<td>39,912</td>
</tr>
<tr>
<td>Ha Lang</td>
<td>18</td>
<td>1,250</td>
<td>22</td>
<td>49</td>
<td>2.2</td>
<td>1,895</td>
<td>849</td>
<td>41,207</td>
</tr>
<tr>
<td>N.Binh</td>
<td>8</td>
<td>1,650</td>
<td>20</td>
<td>46</td>
<td>2.3</td>
<td>2,625</td>
<td>1,121</td>
<td>51,835</td>
</tr>
<tr>
<td>T.Nong</td>
<td>19</td>
<td>1,708</td>
<td>13</td>
<td>46</td>
<td>3.4</td>
<td>2,160</td>
<td>639</td>
<td>32,103</td>
</tr>
<tr>
<td>CAO BANG</td>
<td>77</td>
<td>1,517</td>
<td>18</td>
<td>42</td>
<td>2.3</td>
<td>2,050</td>
<td>897</td>
<td>37,439</td>
</tr>
<tr>
<td>B.Thong</td>
<td>2</td>
<td>1,407</td>
<td>38</td>
<td>91</td>
<td>2.4</td>
<td>1,250</td>
<td>525</td>
<td>47,517</td>
</tr>
<tr>
<td>Na Ri</td>
<td>3</td>
<td>997</td>
<td>6</td>
<td>22</td>
<td>3.4</td>
<td>5,546</td>
<td>1,621</td>
<td>35,128</td>
</tr>
<tr>
<td>Ngan Son</td>
<td>10</td>
<td>1,371</td>
<td>16</td>
<td>45</td>
<td>2.8</td>
<td>1,903</td>
<td>670</td>
<td>29,876</td>
</tr>
<tr>
<td>BAC KAN</td>
<td>15</td>
<td>1,301</td>
<td>17</td>
<td>46</td>
<td>2.7</td>
<td>1,981</td>
<td>721</td>
<td>33,278</td>
</tr>
<tr>
<td>CBBCRDP</td>
<td>92</td>
<td>1,482</td>
<td>18</td>
<td>42</td>
<td>2.4</td>
<td>2,039</td>
<td>866</td>
<td>36,760</td>
</tr>
</tbody>
</table>

An indication of the relevance of the project’s achievements can be understood from Table 5, which compares the project coverage with the district’s total acreage and number of households, if available. The acreage data are DARD 1997 data. Coverage in Cao Bang (20%) appears to be far more substantial than in Bac Kan (5%).

Table 5  Irrigation Component Outputs, PERCENTAGES OF TOTALS

<table>
<thead>
<tr>
<th>District</th>
<th>Existing Total Area</th>
<th>CBBCRDP Coverage</th>
<th>% total ha</th>
<th>Existing Total hh</th>
<th>CBBCRDP Coverage</th>
<th>% hh</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ha</td>
<td>ha</td>
<td>%</td>
<td>ha</td>
<td>ha</td>
<td>%</td>
</tr>
<tr>
<td>Bao Lac</td>
<td>1,200</td>
<td>444</td>
<td>37%</td>
<td>9,200</td>
<td>830</td>
<td>9%</td>
</tr>
<tr>
<td>Bao Lam</td>
<td>1,200</td>
<td>157</td>
<td>13%</td>
<td>8,900</td>
<td>273</td>
<td>3%</td>
</tr>
<tr>
<td>Ha Lang</td>
<td>1,750</td>
<td>391</td>
<td>22%</td>
<td>5,200</td>
<td>874</td>
<td>17%</td>
</tr>
<tr>
<td>N.Binh</td>
<td>1,469</td>
<td>158</td>
<td>11%</td>
<td>7,600</td>
<td>370</td>
<td>5%</td>
</tr>
<tr>
<td>T.Nong</td>
<td>1,242</td>
<td>256</td>
<td>21%</td>
<td>4,600</td>
<td>866</td>
<td>19%</td>
</tr>
<tr>
<td>CAO BANG</td>
<td>6,861</td>
<td>1,406</td>
<td>20%</td>
<td>35,500</td>
<td>3,213</td>
<td>9%</td>
</tr>
<tr>
<td>B.Thong</td>
<td>1,536</td>
<td>76</td>
<td>5%</td>
<td>181</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na Ri</td>
<td>2,113</td>
<td>19</td>
<td>1%</td>
<td>65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ngan Son</td>
<td>1,681</td>
<td>157</td>
<td>9%</td>
<td>446</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAC KAN</td>
<td>5,330</td>
<td>252</td>
<td>5%</td>
<td>692</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBBCRDP</td>
<td>12,191</td>
<td>1,658</td>
<td>14%</td>
<td>3,905</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In general the size and achieved coverage is quite normal for this type of programme in Asian hill and mountain regions. What is however different is the cost per hectare which is much higher than for other mountain regions in South and South-east Asia\(^1\). The costs can be compared with what is normal for completely new schemes. This is not due to high unit costs or high transportation costs, but due to the chosen technology. E.g. in South Asia modernization of schemes is limited mostly to a weir, lining of only the most problematic parts, retaining walls and protection in unstable or landslide areas and canal construction in hardrock. Weirs are also often more simple or even left out. Costs per ha for projects with comparable objectives there are more in the range of €700 to 1500.

3.1.2 Identification and Feasibility Study

Given the staff and time that the project has had, the system of identification, feasibility study and design appears quite sound and most practical. The following steps were part of it.

\(^1\) FAO quotes for a set of medium scale projects in Asia €2200/ha for completely new irrigation and estimates that for modernization of such schemes about 25% of new irrigation development costs is needed, i.e. €600/ha. Modernization is described as canal-lining, additional and improved hydraulic control structures, better land development and new irrigation methods.
1. The GWP states that CBBCRDP has no resources or time to focus on these remotest and poorest communes. Actually this was an underestimation of possibilities as CBBCRDP has truly worked in these remotest and poorest Communes. The Project selected the poorest Communes within the poorest Districts (focus districts) on basis of Government data. Poorest Communes were listed in the official list of the Nation’s 1715 poorest Communes, for which the Government has special programmes.
   - The project did not further specify whom it wanted to reach within the Communes
   - Many of the selected communes have less irrigation potential.
2. The project obtained from focus district DPCs proposal lists that already existed for the 1715 poorest Communes and screened these during identification trips.
3. During identification trips, sometimes few systems were added in consultation between the CPC and project staff
4. The project had no hard list of selection criteria, but identification reports show schemes were selected on basis of a preference for sufficiently big systems and accessible areas. Sufficiently big systems could nearly only be found in valleys
   - Practically no new systems were proposed. The reasons are that after centuries of irrigation development, most potential areas, and certainly all larger areas, are already irrigated. Really new systems could possibly only be found in small areas with small water sources in upland. Any proposals for such were not accepted as these were too difficult and expensive.
   - Any new additional irrigated area would be extensions of existing areas.
   - Annex 8 gives an example how identification worked out in Yen Tho Commune, Bao Lam
5. Identification was often done by one or two engineers, visiting a few systems of a Commune in one day, filling SPOF forms together with the CPC Chairman and few others.
6. Feasibility Study and design was done by consultant engineers, who produced maps, full designs and benefit calculations.
   - Feasibility and identification studies do not provide sufficient detail on potential and likely benefits and on people’s ideas on benefits and O&M. The situation is always simplified. Arriving at such detail however would have needed different skills (agronomist, sociologist, economist, water management) and more time than was allowed.
   - Some parts, like the cost-benefit analysis, are done on a perfunctory way, on basis of very few data and without critical review of these.
7. The Global Workplan elaborately discusses the need for participatory approaches during identification and design stages. It refers even to meetings with potential beneficiaries about the type of technology that might suit their situation and their O&M capabilities. The project was however not equipped for this and has not implemented the intended activities. Generally the users were not called together during the identification or survey to discuss either problems or solutions. Identification teams would go around schemes with CPC officials. The design consultants would do basically the same, except that they would have a bigger group of CPC officials, representatives of various organisations and the Village Head agree on paper to the collected data, the survey and the initial design results. Only few of the signatories were actual users. One Commune official, when asked about the design of the upcoming project, said: “The canal remains in the same place, but for the rest I don’t know what will exactly happen. The consultant was very busy with the survey and had no time to discuss with the villagers. Yes, we all signed.” This is an understandable result of the project not being allowed more staff and time for the purpose. It is fortunate that in many cases the projects were simple and the Commune officials known about the problems, so that they could speak for the people, but that is not enough guarantee for all projects being optimally designed. Projects elsewhere in Asia show that detailed discussions with all villagers nearly always lead to (rational) changes and more optimal designs.

Without having studied this preparatory tract in every detail, it appears sound for all considerations, except maybe O&M, which will be discussed later. The project was not equipped to do this process in any other way. It would have needed more time, more staff, different staff, a different approach and different technology.
For appropriate ownership of the system by the users, however, more attention would be needed for beneficiary interaction, calculations of exact benefit and future O&M duties and agreements with all the actual users (not only CPC and few Village leaders) on design and on O&M obligations. This would have been more in line with what the GWP originally meant. This will be dealt with in more detail in later chapters, especially chapter 4.

3.1.3 Technologies & Design

The GWP mentions as justifications for system improvement: partial design, structural inefficiencies, temporary construction materials and degradation.

- Structural inefficiency is an incorrect term as it implies a low output-input ratio. Local weirs may leak and get washed away each year, but the investment is also comparatively very low. Output-input ratios of these low-input-low-output weirs are in many cases higher than for the high-input-high-output expensive weirs that are designed for a 15-20 years lifespan. For concrete weirs the life span will be higher than for earlier DARD-built masonry weirs, which appear indeed to last 15-20 years, but this still needs a discussion in the project leading to an educated guess.

- The “temporariness” of local weirs is in itself not a disadvantage. Concrete weirs are also “temporary.” For local weirs the repair investment is spread in small bits over 15 years, whereas the repair investment for the concrete weir is probably a once in 15 years big expense.

- Degradation of schemes is not observed in the field, unless in upgraded schemes, some of which are government-managed.

The conclusion is that degradation, temporary construction materials and structural inefficiency are not sufficient as justifications. For the GWP this was however not very important, as irrigation would be taken up anyhow. It indicated that optimal technologies should be arrived at by interaction with the users, but this did not occur. The project has accepted the standard designs and technologies used by DARD in the Provinces. Actually DARD’s policy to concrete all irrigation systems of the Provinces was never discussed or disputed. This was probably the most practical decision under the circumstances. Even in case other technologies would have been available, the project would not have had the time to collect, study and test these, let alone to discuss this with DARD and train all involved engineers. Given the time frame, this would even have been difficult for a specialised irrigation programme. CBBCRDP is not a specialised irrigation programme, but a programme that also does irrigation.

3.1.4 Comments on Designs

In Annex 9 a full list of design items is given with remarks. For most comments also photos of examples are provided to the project. A selection is shown in Annex 20. It is not a complete or detailed list, as the consultant was made to understand at the start-up meeting with the project that scrutinising the designs would be a less important item of the ToR because most designs were already completed and projects ongoing. The comments therefore aim to alert the engineers at issues they might look at a second time, whenever they visit a site or review a design.

General

- Different consultant companies were allowed to use different terms, symbols, designs, which has led sometimes to omissions and confusion in understanding the design.

- Standard designs are used without proper attention. Often one standard page with the designs is included, especially for superpassage crossings, path-crossings and spillways.
  o Chainage/location often not shown. In some cases the location/chainage only can be found in the estimate.
  o In some designs, standard items were shown that were actually not used on the concerned site
  o These standard designs never show site-specific conditions and adaptations. This leads sometimes to e.g. guide walls or floors not being long enough.
Canals
- The canals seem all properly designed for the required design discharge. Also no canal seems unnecessarily overdesigned, although the size of some might be more decreased towards the tail end. Whether users find the sizes enough must still be seen. In some complete canals (non-CBBCRDP) people were observed to fill canals to the brim with risks of damaging it.
- Slope instability is not a problem in most schemes, as canals mostly run through rice fields.
- The canals seem all designed for proper water distribution. Main and branch alignments have been discussed with beneficiaries, but outlet locations have not been discussed with all beneficiaries. Outlet design, quantity and locations should be well discussed with the actual users, to minimize the occurrence of self-made “additional” outlets.

![Image of canal and its components]

Figure 2 The Canal

More adjustment is needed to non-irrigation uses to which people are accustomed. If not provided by the design, people will make washing, bathing or hydro installation arrangements themselves by blocks and holes, thereby decreasing efficiency and increasing the risk of O&M problems. Provisions for household use like “laundry steps” are known and were also observed in other DARD projects.

Weirs
- Weirs are generally constructed very strong and low in maintenance. Most of it will stand easily 15 years of intensive use. The streams also hardly ever carry boulders that can damage the weirs. Weirs in steep sections (example: upper weir Ban Pan, Yen Tho) however need more attention.
- Spillways in the weirs should be close to the intake, especially in low flow streams, where water needs guiding towards the intake opening. Example of problem: Na Vi in Huong Ne, Bac Kan.
- Appropriate provisions for silt traps and intake gates have been made and observed in some systems, but not in all places where they would have been appropriate.
- Quite a few weirs lacked necessary river protection downstream from weir. Example Na Vi in Huong Ne. Care should be taken to incorporate chances that the stream below the weir will direct itself differently after construction, as was observed in at least one ADB/DARD-upgraded canal (Na Chuong, Luc Binh).
- Quite often canals are added to DARD-built weirs. Some of these weirs (example Ban Pieng in Luc Binh, Bac Kan) would need adjustments and provisions like protection, silt trap, spillway. The project should not shy away from changing or adding to DARD works if necessary.
- Guide walls for some weirs are too short upstream with risk of the stream by passing the weir. Example Ban Pan in Yen Tho.
Some weirs were made far too big (Dong Lung and Ban Chang II in Yen Tho) when considering both the potential maximum flow and the actual stream bed width, which in Dong Lung was 5 times as narrow as the weir. Not only funds are wasted but also the villagers will have more difficulty during low flows guiding the water to the intake.

Whether seepage and underflow at the weirs is a problem cannot be judged during the wet season. This is possible if the cut off wall is not deep enough and if there are gaps between weir wall and underlying rocklayers. As the soils (and bedrock) can be quite permeable, this needs review in dry season.

Some small sources are both drinking water and irrigation sources and need adjustments in design to serve both purposes. Examples: Lung Vay and Buu Dien-Tap Na in Thanh Long Commune (Thong Nong).

Some sidewalls can be damaged or bypassed during floods.

Not all intakes have gates, so that surges and sand can enter during floods and water can not be stopped during repairs.

Sand gates are in practice not opened frequently.

This area normally silts up completely, so that water must be channelled to intake.

Many canals have no silt traps so that canal gets silted up and loses capacity.

The sections along streams are often damaged by river erosion, especially after weir affects course of the stream.

3.1.5 Implementation
The organization of implementation is not a subject of review in itself, but it is important to make remarks, as it is the one area to which the present team has been requested to give first priority and as it has influence on both design and O&M.

The overall structure of project staff, supervision consultants and contractors appears a sound one for the circumstances. Progress might be low in quantity (acreage) and quality (e.g. participatory planning) when compared to targets of the Inception Report, but is quite normal for such projects and even quite good in view of the obstacles provided by terrain and procedures. That the original targets (earlier documents aimed at 7000ha, resp. 3500ha) were not met, had less to do with slow progress than with those targets being unrealistic.

The quality of construction is quite high in spite of supervision constraints from project side (few staff). There have been questions whether construction should not be done more by villagers and whether NGOs should not be involved more. The currently used designs however demand the use of qualified contractors and sound supervision. More involvement of NGOs or local people in actual construction would not have been possible without a negative effect on construction quality and quantitative progress. Their involvement would require a very different overall approach and time frame.

3.1.6 General
Overall, without considering the O&M and sustainability issues to be discussed later, the designs were sound, although there is certainly still room for improvement. Due to complete lining and full-concrete weirs, the cost of construction is high compared to other countries, where only bottlenecks are addressed and where costs per hectare for system modernisation are consequently often below €1000/ha. Overall,
construction outputs have been satisfying in qualitative and quantitative respect, especially in view of the obstacles that terrain and procedures posed.

3.2 More Water (D)
The main aim of the schemes is to make more water available for cultivation.

3.2.1 Primary Output: More Water
The purpose of upgrading schemes was to provide for more water in both wet and dry season. In general the used technologies are able to achieve this. Much more water is caught at the weir and much less water is lost during transport than in local systems.

Especially for the dry season there are however a few questions to be answered:

a) Is any downstream system affected when an upgraded upstream scheme catches more water?
This question was asked in all visited locations. People stated there were no such problems. However in most of these locations people had only experience with wet season irrigation. Where people state that there was not enough water for dry season irrigation through local canals, it might mean that upgraded schemes will preclude neighbouring schemes to be upgraded in similar fashion. More study is needed during the dry season in situations where several schemes along smaller streams are upgraded simultaneously like in Yen Tho Commune, Bao Lam. See chapter 6

b) How much water is actually lost in small schemes?
Actual losses are of course difficult to assess. Farmers, who were asked about it, mentioned 30 to 50% of water. It should be realized that internationally a 70% efficiency figure (30% loss) is normal for earthen canals of 1 to 2 km. Even in a concreted canal 10% or more water will be lost at outlets and other structures that can not be completely closed. An indication on how various efficiencies might compare with each other is given in the table below. To check the assumptions, small tests can be done in spring at sites where farmers mention high water losses.

Table 6 An Indication of Irrigation Efficiencies

<table>
<thead>
<tr>
<th></th>
<th>Concrete weir</th>
<th>Concrete main system, 4 earthen branches</th>
<th>Concrete weir earthen canals</th>
<th>Boulder weir concrete canal</th>
<th>Boulder weir earthen canals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Weir</td>
<td>80%</td>
<td>80%</td>
<td>80%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>Canal</td>
<td>72%</td>
<td>56%</td>
<td>48%</td>
<td>36%</td>
<td>24%</td>
</tr>
<tr>
<td>Field</td>
<td>58%</td>
<td>44%</td>
<td>38%</td>
<td>29%</td>
<td>19%</td>
</tr>
</tbody>
</table>

Efficiencies: Concrete weir=80%; local weir= 40%; Concrete canal=90%; earthen canal=60%; field=80%

c) Over how much length of canal is water loss prevented?
Losses are only real losses if they are lost for rice cultivation in the concerned area. That happens only if seepage is straight down (percolation) to lower soil strata, laterally to uncultivated areas, including back

Figure 4 Layouts of Irrigation Systems

to the stream, or to areas that have already enough water. The lay out of systems matters here.
In some systems there are two or three main branches (A), in others numerous short secondary ones (B) and again in others none at all (C). Types B and C are most common. Only in few cases a major branch (type A) is also lined (e.g. Na Don, Tam Kim Commune, NB), but branches in type B or D are never lined. In the rarer systems of type D, i.e. the concrete canal with 4 earthen branches of Table 6 (e.g. Ban Dau, Thanh Long Commune, TN), lining of the main canal prevents only a fraction of possible water loss. In any case
most of water transport is from field to field and real losses (percolation to lower strata) there cannot be prevented. Systems where real losses could be big, i.e. types F and D and even type E, are rare. They were dropped during the identification stage. Most command areas start nearly at the intake (A, B, C) and the canals run along the upper fringe. Seepage in such situations often feeds lower areas through ground water.

d) How much of water loss is a real loss?
Not enough is known about water losses and groundwater movements. E.g. not all “lost water” might seep straight down. Part of it might move in to the neighbouring fields which need therefore less irrigation water. Similarly the upgraded scheme will receive some lateral groundwater flows from upstream schemes. It is not possible to assess this in detail.

e) Will there be more water at the places along the canal where people actually want it?
People are used to tapping their water from any canal location. With a concrete canal that is not possible anymore as outlet locations are fixed and their number limited. People as a result need small conveyance channels to get the water from official outlets to their fields. This leads to water and land loss and extra organisation problems. Alternatively, people cut in to the canal wherever they want a hole, like is observed in any masonry canal in Cao Bang, and reduce thereby the canal efficiency also. In concrete canals this is less possible, but that does not solve the people’s problems. The problem cannot be completely solved as making too many outlets would make the project too expensive and could lead to extra water losses. In any case care should be taken to thoroughly consult the actual users of each canal section about the ideal location and number of outlets.

f) Will there be enough water at the tail end and for the proposed newly irrigated areas?
Only with improved water management/organization the tail enders and extension areas will benefit. It has been observed in few schemes, also outside the CBBC area, that users at the canal head increase domination of management and care less about saving water for less influential people like the poor or the tail enders once those people are less needed for regular weir maintenance. Although this occurs more in larger multi-village schemes, which are practically absent in the set of CBBCRDP sub-projects, it will still happen on a small scale in CBBCRDP sub-projects, especially where users from other villages cultivate small areas towards the tail end. Examples are Hoang Man (Tam Kim Commune, NB, type A/F) and Ban Dau (Thanh Long Commune, TN, type D). This is a universal problem, which partly can be reduced by inclusion of tail-enders in WUAs and by adequate agreements between different sections.

g) Is there enough water to attempt dry season irrigation?
This most crucial question of all cannot be positively answered for all schemes. All schemes were checked for water availability in the source during the critical period of April. The SPOF source discharge data were taken as basis for this. Reviewing SPOF discharge estimates during field visits, it appeared that in all but very few cases, these were very realistic. Only very few figures were adjusted on basis of observations during the mission. See Annex 10.

As most SPOF visits occurred outside the month of April, in Annex 10 the recorded source discharges have been multiplied by a different factor for each month. For an estimate of this factor and dry season flows, interpretation of hydrological data was needed, although such data are only available for big rivers. The factor was derived from hydrological data of the Bang Giang river at Cao Bang Town, as found in a graph in the Water Resources Sector Review report (1996). Rough data for Cao Bang (rainfall and discharge(Q) of the Bang Giang river) are plotted in the graph below.

---

2 Agreements on rotation, irrigation periods and frequency, and preventing water wasting in upper canal
As seen in the graph, seasonal variations of the river follow those of rainfall, with only a small time lag. This is observed in most rivers in northern Vietnam. The variations of smaller streams and rivers can be expected to follow rainfall variations even closer. Important is that the variation between discharges in the rainy and dry months can be a factor of 10 in the case of bigger rivers. The reliability of this happening is however lower for smaller rivers, as the variation within months and between years is higher. More caution is needed in using averages as “guaranteed water flows” for dry months. The factors applied are tabulated herewith. April is taken as 100%. This means that an average discharge of 100 litres per second (lps) in July will probably mean an average of 18 lps for April (18%). Of course a check on water availability in all sub-project sources in April 2003 will help to arrive at more reliable multiplication factors.

Table 7  April Discharge Multiplication Factors

<table>
<thead>
<tr>
<th></th>
<th>J</th>
<th>F</th>
<th>M</th>
<th>A</th>
<th>M</th>
<th>J</th>
<th>J</th>
<th>A</th>
<th>S</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>150%</td>
<td>150%</td>
<td>150%</td>
<td>100%</td>
<td>60%</td>
<td>20%</td>
<td>18%</td>
<td>14%</td>
<td>23%</td>
<td>43%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>60%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>75%</td>
</tr>
</tbody>
</table>

Assuming that a weir can catch 80% of stream flow and knowing that the DARD design discharge is 1.25 litres per second per hectare\(^3\) (lps/ha), it was estimated in how many cases a spring crop was feasible. For flows of 0.5 to 1.25 lps/ha it was assumed that still 50% of the area might attempt a spring crop. Spring crops were estimated as unfeasible where the available discharge dropped below 0.5 lps/ha. The figure of 0.5 lps/ha is chosen as experienced people of Ban Pieng (Luc Binh, Bac Kan) believe that double cropping is feasible for their area, even though they have a dry season flow of only 0.53 lps/ha. Again, many lesson can be learnt from a visit during the dry season to this already functioning scheme.

The result is shown in Annex 10 Water Availability and Spring Crop Potential. For six schemes no source discharge data could be found and these have not been included in the count. Of the rest, it appears that 33 schemes (38%) under this calculation might not have enough water for dry season irrigation, at least not for the whole area. Fifteen schemes (17%) might attempt to irrigate a spring crop on 50% of its area. The other

---

\(^3\) This means that an area of 100 hectares needs a canal discharge of 125 litres per second to irrigate all area well. The figure of 1.25 lps/ha appears a practical figure for the wet season, but its validity for the dry season needs scrutiny.
38 other schemes (44%) should have enough water to irrigate a spring crop. Applying these percentages to the total of 1658 ha lead to an estimated additional 684 ha that might be irrigated in spring. The analysis The Annex 10 table attempts on basis of this in its last columns at a more useful calculation of cost per hectare, using potential cropping intensity⁴ as factor. See chapter 3.3. For a proper selection, the analysis as made in this chapter should have been made for each system during the feasibility phase.

It is needless to say that the number of assumptions is high and thorough study and calculation is needed to arrive at more accurate figures and to rule out errors. This can be done during a next mission. See Chapter 6.

Table 8 basically does the same calculation and a short analysis of Bac Kan schemes for various efficiencies. The discharge (measured during dry season) is divided by the proposed command area size to assess sufficiency for double cropping. Efficiency percentages for concrete and local systems are based on experience figures. They indicate the amount of water that can be diverted from the source to the canal and field outlets during low source flows. The table shows that with local weirs only one system can irrigate during the dry season⁵, while this number increases to eight when concrete weirs are constructed. However, the number will decrease in case the systems are not well maintained or in case of dry years.

Table 8  Dry Season Water Sufficiency in 14 systems, Bac Kan Province

<table>
<thead>
<tr>
<th>Q (lps)</th>
<th>ha</th>
<th>100% Efficiency</th>
<th>80% Efficiency</th>
<th>25% Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Theory</td>
<td>Upgrade</td>
<td>Local System</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td>0.5</td>
<td>0.40</td>
<td>0.13</td>
</tr>
<tr>
<td>8</td>
<td>10</td>
<td>0.8</td>
<td>0.64</td>
<td>0.20</td>
</tr>
<tr>
<td>25</td>
<td>30</td>
<td>0.8</td>
<td>0.67</td>
<td>0.21</td>
</tr>
<tr>
<td>22</td>
<td>25</td>
<td>0.9</td>
<td>0.70</td>
<td>0.22</td>
</tr>
<tr>
<td>17</td>
<td>19</td>
<td>0.9</td>
<td>0.72</td>
<td>0.22</td>
</tr>
<tr>
<td>31</td>
<td>25</td>
<td>1.2</td>
<td>0.99</td>
<td>0.31</td>
</tr>
<tr>
<td>20</td>
<td>15</td>
<td>1.3</td>
<td>1.07</td>
<td>0.33</td>
</tr>
<tr>
<td>35</td>
<td>25</td>
<td>1.4</td>
<td>1.12</td>
<td>0.35</td>
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<td>15</td>
<td>10</td>
<td>1.5</td>
<td>1.20</td>
<td>0.38</td>
</tr>
<tr>
<td>35</td>
<td>20</td>
<td>1.8</td>
<td>1.40</td>
<td>0.44</td>
</tr>
<tr>
<td>25</td>
<td>10</td>
<td>2.5</td>
<td>2.00</td>
<td>0.63</td>
</tr>
<tr>
<td>30</td>
<td>12</td>
<td>2.5</td>
<td>2.00</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>15</td>
<td>2.7</td>
<td>2.13</td>
<td>0.67</td>
</tr>
<tr>
<td>40</td>
<td>15</td>
<td>2.7</td>
<td>2.13</td>
<td>0.67</td>
</tr>
<tr>
<td>15</td>
<td>5</td>
<td>3.0</td>
<td>2.40</td>
<td>0.75</td>
</tr>
<tr>
<td>45</td>
<td>10</td>
<td>4.5</td>
<td>3.60</td>
<td>1.13</td>
</tr>
<tr>
<td>23</td>
<td>5</td>
<td>4.6</td>
<td>3.68</td>
<td>1.15</td>
</tr>
<tr>
<td>300</td>
<td>7</td>
<td>42.9</td>
<td>34.29</td>
<td>10.71</td>
</tr>
</tbody>
</table>

Source: SPOF Forms CBBC RDP Bac Kan

The conclusion is that irrigation gains in terms of water will be for some systems less than what is needed to justify the investment.

3.2.2 Secondary Outputs: Maintenance

One other output should be dealt with here as villagers frequently mention this as a major benefit, especially before construction. They look forward to the reduced maintenance workload that concrete schemes promise, especially the reduced burden of frequent weir reconstruction. Indeed does maintenance work reduce, especially in the initial years.

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⁴ Cropping intensity is the percentage indicating how many crops are yearly grown in one area. E.g. 100% can be one crop for whole area or two crops on 50% of the area. Double cropping indicates two crops per year from one field (200% cropping intensity).

⁵ The question whether this one system actually would have needed an RCC weir was not studied during the mission.
a. Weir. 100-200 labour-days saved per year
People mention most often as benefit that they do not have to repair the weir anymore. Depending on
the weather and flood conditions this they have to do at average twice a year, varying from zero to five
times. Per repair, this costs each family about 3 labourdays, i.e. six labour days per year. As the system
is practically a free gift, this is a pure gain of €100 to 300 per year, assuming 15 to 45 households and a
daily rate of € 1. This is a gain in quality of life and can be also an economic gain, but only if the saved
days are wisely invested in productive development.

b. Canal. No saving on cleaning silt and vegetation
Cleaning the environment of the canal and desilting it will hardly be less. Most canals do not have a silt
trap and where they have it, it is not emptied well and regularly, canceling out the intended impact.

c. Canal. Saving on small and big repairs: maybe 50-150 labour days per year
Most repairs in an earthen canal are done by people who are irrigating or are inspecting the canal. These
people are anyhow in the fields. The concrete canal will also breakdown, but far less frequently. If it
breaks down, the repair of cement work cannot be done by one or two people irrigating at that time. In
the beginning the savings will be more (up to 150 days per year), but as the canal ages, breakdowns will
be more frequent and the difference slowly disappears.

Opening and closing canal branches by removing or inserting planks is less labour-intensive than the
earthwork involved in earthen canals. The assumption is that the canals have these shutters. In some
they did not, in others no provisions were designed for a gate (or gate groove) at intake. However, the
observations in older schemes is that within one year the shutters are removed and closure and opening
are done in the same old fashion with boulders, twigs and earth.
It was observed, especially in Luc Binh, that people keep the canal continuously running as they need
the water also for other purposes: laundry and dish washing water, household water, water for livestock,
micro-hydro, fishponds. For these purposes obstacles are put in the canal that lower the efficiency.

Certainly, there are maintenance labour gains for the short term. Whether these are also long-term gains
depends on too many other factors and requires analysis of more site-wise data than are now available
to the project. It is beyond the scope of the project to make such detailed study.

3.3 More Areas, Higher Cropping Intensities, Higher Yields (E)
The question is what the immediate effect will be of upgrading these more than 90 schemes.
The project aimed to increase the area under a second crop, to increase irrigated area and to increase yields.
That the maximum will not be reached has several reasons as shown already in previous chapters. Firstly, in
some areas, maybe 40% of schemes, dry season water availability might not be enough for a second crop.
And even where it is enough, lining and weirs might not solve all problems. Thirdly farmers often appeared
to have different motivation and referred in some schemes more to the hoped for reduced maintenance
workload than to production increase. In others they openly doubted whether many farmers would be
motivated for a second crop. This reluctance was shown in the less accessible Communes of Yen Tho and
Huong Ne and not in more accessible Communes like Luc Binh, Tam Kim and Can Yen.

The effects can only be roughly estimated, also because the project does not have yet either essential
baseline data related to benefits in a processed form or a benefit monitoring system. The next mission
should be used to consider and prepare what is still possible in this respect.
The mentioned rough estimate of achievements can be based on the analysis given in Annex 10 and study
of sample schemes like those taken from Bac Kan. Reference is provided by relating these to results from
the assessment by SLLCRDP of eleven schemes constructed earlier in their provinces, an environment that
is not unlike the CBBBC RDP project area.

SLLC-data show that if there is enough water, in potential the production per scheme can be doubled by
improved irrigation. Of the extra 100%, some 80% results from conversion to double-cropping, some 10%
from adding formerly unirrigated areas and 10% from yield increases. The SLLC assessment shows the following for the average scheme:

### Table 9 Average Benefits from Eleven Schemes, Son La Lai Chau (Production values in US $)

<table>
<thead>
<tr>
<th></th>
<th>Value without project</th>
<th>Value with project</th>
<th>Increase</th>
<th>Increase crop value/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer crop</td>
<td>$4,470</td>
<td>$5,819</td>
<td>$1,349</td>
<td>$8/ha (2-3%)</td>
</tr>
<tr>
<td>Spring Crop</td>
<td>$299</td>
<td>$305</td>
<td>$6/ha</td>
<td>(2%)</td>
</tr>
<tr>
<td>Total scheme</td>
<td>$4,769</td>
<td>$10,087</td>
<td>$5,318</td>
<td>$14/ha</td>
</tr>
</tbody>
</table>

Area*Cropping Intensity

<table>
<thead>
<tr>
<th></th>
<th>15ha*107%=16ha</th>
<th>19ha*174%=33ha</th>
</tr>
</thead>
</table>

Source: SLLCRDP, Analysis of Irrigation and Terrace Schemes, January 2002

These figures for potential seem realistic for CBBCRDP potential, too, provided there is enough water and provided the benefiting farmers see enough benefit in work on a second crop. The figures can also be compared to figures for the overall potential, which are DARD-figures used in the Appraisal Report 1997. The table below provides a rough overall picture.

### Table 10 Possible Overall Result, Irrigation Component

<table>
<thead>
<tr>
<th></th>
<th>CBBC FA</th>
<th>CBBC GWP</th>
<th>CBBC Potential</th>
<th>%-age of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total existing ha</td>
<td>35,000ha</td>
<td>7000ha new potential</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total no. schemes</td>
<td>11,300</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved Irrigation</td>
<td>12,000ha</td>
<td>7,000ha</td>
<td>3,500ha</td>
<td>1,650ha</td>
</tr>
<tr>
<td>From 1 to 2 crops</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>685ha</td>
</tr>
<tr>
<td>From unirrigated to irrigated</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>160ha</td>
</tr>
<tr>
<td>Households</td>
<td>&gt;50,000hh</td>
<td>?</td>
<td>?</td>
<td>3900hh</td>
</tr>
<tr>
<td>No. of schemes</td>
<td>230</td>
<td>175 – 350</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>Unit cost €/ha</td>
<td>€700/ha</td>
<td>€1400/ha</td>
<td>€2000/ha</td>
<td></td>
</tr>
</tbody>
</table>

3.3.1 More Irrigated Area

The project might add about 100 to 200 hectares to the already irrigated areas. This might seem low, but the project’s identification studies and this mission’s field trips show that the project has at least exhausted 50% of the potential for new irrigated areas. This indicates that the project’s Communes will not have more than 200-400ha potential. The figure of 7000ha newly irrigable area that DARD gave to the Appraisal Mission in 1997 must therefore, if correct, concern other Communes and Districts. Anyhow, the probably achieved 160ha is not a low figure compared to what was possible.

The GWP had also not expected more. It states: “It appears unlikely that CBBCRDP can promote introduction of irrigated rice production on land not yet under the command of existing diversion structures. DARD did also not propose new schemes. Only some fringe areas might be added with relocating the canal.” This appears correct. Added newly irrigated areas are indeed all extensions of existing systems. Figures used in the table above are based on extrapolating of a check of data for 30 systems. The figures will probably have to be reduced because some areas were observed to be previously irrigated from other (less reliable) sources. See the example of Hoang Man scheme in the text box below in this chapter. As no data are available, no reductions have been made in the figures yet. As a result, the given figures can be considered to be the maximum potential.

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6 Unlike in the SLLC report weighted averages are taken as this was felt more appropriate.
**Hoang Man Scheme in Pac Dai Village, Tam Kim Commune**

Hoang Man in Tam Kim Commune (Nguyen Binh) had five other systems irrigating parts of the same wide area, overlapping with the system. An attempt has been made to show the overlaps in the figure below. Once the now dysfunctional canal will work again, only the temporary system (t) will be fully replaced.

**Figure 6** Overlapping Irrigation Systems Pac Dai, Tam Kim

Not only will the others continue to irrigate some areas outside the reach of Hoang Man (although limited in winter by water shortage), but also will they probably irrigate their old areas in Summer as well, because people will prefer to use the old canals as they are easy to manage (few co-users, small, short and closer by home). These local systems will also help out in future times if Hoang Man has either water or maintenance problems. This is possible because systems 1-4 and Hoang Man all concern the same people of one village (Pac Dai) and are all managed by the same Headman. Only the areas to the right under Hoang Man canal (including the potential extension) partly belong to another village.

The lessons learnt are thus:

- benefits are not always what they initially seem
- benefits will vary per year
- benefits must be calculated in more detail
- benefit calculations can be complex

### 3.3.2 Higher Cropping Intensities

The Global Work Plan (pages 81 and 82) states that construction of the projects are unlikely to lead to double-cropping and that more effect can be expected from agricultural programme activities. The mission estimates that the double cropping area of 685ha shown in Table 10 is technically possible. This has been estimated from Annex 10 (see chapter 3.2.1).

The mission agrees with the importance of extension activities, but disagrees that double cropping will be an “unlikely” result from irrigation construction. The assessment in SLLC has even found an increase in cropping intensities of 70%. Calculations for CBBCRDP lead to a potential 40% of the area. Farmers’ reluctance towards double-cropping in remoter areas (as expressed by people in e.g. Huong Ne, Yen Tho) will reduce the figure, but certainly not to zero percent. To arrive at reliable estimates for CBBCRDP prospects depends on studying further the April water availability, the farmers’ readiness for an extra crop,
the likely time it takes for farmers to adopt a second crop, as well as checking whether any conditions are different from Son La Lai Chau schemes. For the moment an increase of 40% can be assumed. After more study during next mission, possible remedies to reluctance will be discussed with CBBCRDPP's Agricultural section.

Whereas the effects on a local level can be considerable, the total effect should also be put in provincial perspective. The effects of these projects on overall Provincial level cropping intensities will be minimal. The double cropped area is 42% in Bac Kan and 14% in Cao Bang, or in total 8200ha (23%, DARD 1997). The maximum of 685ha would constitute a 7-8% increase of double cropping to 8900ha or a 2% increase of cropping intensity from 123 to 125% for the total Provincial areas.

3.3.3 Higher Yields
Reliable water supply will have two effects. The crop yields will directly benefit if no water stress is experienced, and the application of other yield enhancing inputs (seed, fertilizer) will become more feasible. Again the SLLC report provides the most reliable basis for an estimate. The report observed in the reviewed schemes an increase of 10% crop yields compared to the before project situation. This seems far more realistic than the high figures provided by the reports from CBBCRDP feasibility study -consultants.

3.3.4 Summary Effects
The conclusion should be that the project has gone far enough in its objective to attempt “expanding irrigated double cropping to the limits of seasonal water availability”, as the GWP logframe puts it. To learn more precise lessons, more detailed study during the stressful period of the dry season is recommended. Study should shed enough light on water availability, farmers’ limitations and potential of the used technologies.

Care should be taken to assess the variation over a sufficiently large number of years and the variation within years. If this variation is added to the often very confusing situation on the ground (benefiting area, variations per year and season of command area), the assessment will be probably complex.

3.3.5 Verifiable Indicators
The Global Workplan gives the following indicators:
- Irrigated double-cropping has been stabilized in lowland communes
  - The stabilisation of double cropping in all potential areas covered by scheme upgrades under CBBCRDP can not be achieved during the project’, as the transition takes time.
- Irrigated double-cropping has expanded to the limits of seasonal water availability
  - Without baseline data it is not possible to say. Impressions are that progress has been booked towards approaching the limits of seasonal water availability for the target Communes.
- Upland and lowland farmers are more productive in cereals, minor crops, agro-forestry and livestock
  - Lowland farmers will be more productive in cereal production due to irrigation

The indicators are of course very general. Without further specification and without baseline data they are not meaningful enough. It is not known whether DARD has more accurate figures than in 1997. At least these data might be studied in further detail. They seem to be based on data collection at Commune level and Commune specific data might be obtained.

As for the sub-projects the following data should become available as indicators:
1. Yield increases. To be obtained by collecting actual Summer and Spring yield levels in any nearby already upgraded systems with the present yields in the scheme area.
2. Spring crop potential. This can be estimated by using various indicators, most of which are not known now:
   - water availability. If Q= 0.5-1.25 lpspha => 50%; If Q = more than 1.25lpspha => 100%
   - food shortages. If food shortage than 100% prospect
   - surplus sale prospects. If transport problems, then potential reduced by at least 50%
   - attitudes. If all indicators above are positive, but farmers show still reluctance, as yet 50% reduction
• Spring crop cultivation or attempts at it in the scheme area, in neighbouring areas and in nearby previously upgraded systems
  a. All these indicators need finetuning for increased accuracy:
  • More hydrological analysis to update multiplication factors to arrive at April source flows
  • Find for which areas another month than April should be taken as the critical month
  • Irrigation efficiency estimates might need to be updated by testing.
  • Market rice prices, land prices and food shortages need to be known
  • Farmers’ other activities during Spring need to be known
3. Area increase. More accurate data are needed to assess real potential:
  • Exactly which area will be added? Location on map needed.
  • For which seasons?
  • Who are owners?
  • Was the area previously irrigated from another source? How reliably? For which season?

With more grip on these factors a precise set of indicators can be formulated. It will be clear that actually the agricultural project component should have been involved from identification onwards and should have made agricultural considerations like the ones given under the indicators, the leading factors in the selection process and design.

3.4 **More Food, More Income (F)**

The ultimate issue in a review is whether the objectives were met. Four set's of objectives are relevant in this respect. Firstly, the objectives as stated in the Global Workplan and Financial Agreement. Secondly and thirdly, the objectives of the Government of Vietnam and the objectives of the EC. Normally the project objectives should be located in the area where GoV and EC objectives overlap. Fourthly the objectives as actually pursued by the project after adjustments to reality on the ground.

DARD's objectives will be the following:
1. More food
   a) for food shortage areas of Cao Bang Bac Kan
   b) for the nation
2. More income
   c) for poor areas of Cao Bang Bac Kan
   d) for the nation

For this project the EC's objectives, as can be read from Global Workplan and Financial Agreement are limited to 1.a and 2.a. The GWP acknowledges that the government has national objectives and welcomes any convergence of national and poverty alleviation objectives, but makes it clear that national objectives are not the same as objectives for EC cooperation in Cao Bang and Bac Kan. It is clear that the project’s objectives relate to more food and income in the area itself. The intended beneficiaries are poor communities in the project area.

A few qualifying remarks should be made about what is written on objectives in the Global Workplan or Financial Agreement:
1. The objectives are formulated as maximizing benefits from irrigation. There is no reference to whether interventions should be economically feasible or sustainable.
2. Irrigation in the texts is clearly linked to relieving food shortages. There is however no analysis of the problems related to income and food, nor a detailed food shortage analysis for specific Communes or population groups.

The objectives are not specific to target groups, except a choice for poor Districts and Communes in general.
It is not surprising that the project in the absence of an analysis of poverty and food shortage, a lack of specific target groups and a lack of clear demands regarding economic feasibility and sustainability, has opted for a pragmatic approach of selecting schemes from. DARD’s programme of upgrading and concreting existing systems, which in turn is consistent with the Government of Vietnam’s drive for the relief of poverty”.

In the present project phase more light can be shed on the relevance of this approach vis-à-vis the objectives of poverty alleviation and food security. This is done in the following chapters.

3.4.1 More Food for Food Shortage Areas
Field observations and data collection raise question marks that could have been avoided with a sound problem analysis:

1. The project has chosen for the poorest districts and poorest communes. It has dealt with these communes as if they were homogeneous units. In fact however there are considerable differences in livelihoods, culture, education, access to services and political influence within the communes among the various villages. These differences run very much along ethnic lines. It is therefore not surprising that irrigation schemes and benefits have accrued to specific ethnic groups and not at all to others. See for more details Annex 11 and for distribution maps of ethnic groups over Cao Bang’s districts Annex 12.

2. None of the interviewed officials reported food shortages for irrigation scheme villages. It should be confirmed whether this is true for all irrigation schemes. Communes that were asked to indicate villages with food shortages only sometimes would mention villages with little or no irrigation that were generally located higher up in the hills and often populated by Dao and more often Hmong. Observations of houses and people in these higher areas and communities confirmed the general impression that these are the poorer communities. Also the reluctance to grow a second crop in less accessible Communes (Yen Tho, Huong Ne) can be explained by the fact that irrigating villages are generally not short on food. A second crop for them is only interesting if you can easily sell it.

3. Food shortages in higher up villages are often solved within the communities. Very few people enter in to debt dependency relations with outsiders nor do many people from poorer villages work on richer villages’ lands or travel to towns for migratory labour. If the problems would get very pressing villagers might attempt to migrate permanently, like happened in the eighties. Anyhow, a trickle down effect from valley villages to upland villages will be very small. The only imaginable effect might be that irrigating villages have more money to buy livestock and other things from poorer villages. Confirmation of findings and an overall proper analysis is needed.

4. Food shortage villages that can buy food (by sale of livestock or receiving Government aid), were said to buy this locally, i.e. from the surpluses that already exist. Any such demand can generally be met already by those irrigating villages that have already food surpluses. Every Commune seems to have one or two surplus villages.

The findings indicate that the impact of the irrigation component on relieving food shortages in the target Communes, either directly or indirectly, can not be taken for granted. It is up to the project to assess the importance of the observations and to decide whether more study is needed.

3.4.2 More Income for the Community
Possible impacts on income should be looked at, too, regardless of who the actual beneficiaries are. Three remarks can be made:

1. The SLLC Report on irrigation shows clearly that weir-cum-lined canals are economically not justifiable at village level. This means that the benefits are not sustainable unless the government continues to contribute money for big repairs and rehabilitation for e.g. social reasons. The CBBCRDP O&M cost calculations under chapter 3.4.3 further on show the same.

2. The project targets the poorest communes in poorest districts. Observations indicate that within these communes the richest and most influential society segments benefit most from the irrigation component, because the project selects areas that are already irrigated, are sizeable and are accessible and not too expensive to irrigate. See Annexes 11 and 12 for a short analysis of beneficiaries.
3. The result of point 1 and 2 would be that the government with EC-support commits itself to a long-term expensive social programme that benefits the richer sections of the poor Communes and will due to choice of sector, technology and approach, never be able to reach the poorest villages. As the various communities are not strongly economically integrated, benefits accruing to one will generally not bring indirect benefit to the poor villages either.

3.4.3 Sustainability of Achievements
Sustainability concerns are basically social and economical concerns. The following calculations of O&M funding are therefore reinforcing the earlier chapters of social and economical feasibility. The question dealt with here is whether the achievements can be sustained institutionally and economically.

Institutionally both the WUA concept and the framework relating these to Communes and District authorities are very new and at least teething problems can be expected. At the other hand the villages have strong internal cooperation traditions which will take care of most of the institutional needs. Also the government institutions appear quite strong in their determination, capabilities and funding situation. This will be further strengthened during the policy formulation phase of the WUA support programme. The teething problems will likely occur on the organisational side of resource mobilisation and bookkeeping and on the delegation of responsibilities from District to Commune and from Commune to Village. So far nearly all bookkeeping, financial management and decision making for any fund-based intervention was done by the Districts and a little only by the Commune. For sustainability it is essential that the balance shifts heavily towards the village, i.e. those that actually operate, maintain and benefit. It will however take time for people to adjust attitudes, skills and practices. During this transition time, things can go wrong and the process might be disrupted. Not all WUAs should be expected to survive this transition time. In some cases the beneficiaries can then fall back on the old structures without much harm to the system and benefits. In others the benefits will be lost.

Economically the crucial question is how high the costs of O&M are and whether the resources needed for operation and maintenance will be mobilised.

The project uses a design life time of 15 years, although the infrastructure section estimates that life spans will be longer. Field observations indicate that a life time of 15-20 years might be appropriate for the cement masonry works of the 1980's. Some of these are indeed being replaced at present. As CBBCRDP uses reinforced concrete in stead of masonry, the actual life time will be more. It is important for the project to make a better guess for the benefit of realistic O&M calculations. In an update of the calculations during a next mission this improved "guesstimate" will be used.

If one takes the design life time of 15 years as starting point, the required investments by the beneficiaries will be basically the 100% replacement\(^7\) in 15 years lifetime plus the annual repairs, which can be put in line with international experience figures (2-5%) at 2% of the initial investment. To simplify calculations the 2002 figures will be used and not be adjusted for inflation and so.

With the CBBCRDP average figure of €2000/ha investment for projects with an average of 19ha, this would give the following picture:

\[
\begin{array}{|c|c|c|}
\hline
\text{Average cost: VND 570 million, i.e. €38,000 or} & \text{2000} & \text{€/ha} \\
\text{Replacement in 15 years:} & 133 & \text{€/ha/yr} \\
\text{Repair at 2% per year:} & 40 & \text{€/ha/yr} \\
\text{Total O&M per year} & 173 & \text{€/ha/yr} \\
\hline
\end{array}
\]

If one would use a 30-year lifetime, the total repair and replacement cost would be about 40% less:

\[
\begin{array}{|c|c|c|}
\hline
\text{Replacement in 30 years:} & 66 & \text{€/ha/yr} \\
\text{Repair at 2% per year:} & 40 & \text{€/ha/yr} \\
\text{Total O&M per year} & 106 & \text{€/ha/yr} \\
\hline
\end{array}
\]

\(^7\) This will probably be a rehabilitation, but rehabilitations tend to cost as much as total replacement.
Farmers and DARD are not communicating in Euro’s but in kg paddy per ha per year. The average for all committed systems for which details are known would be 273kg paddy/ha/yr in repairs only and 1,182kg/ha/yr when including replacement in 15 years (727 kg/ha/yr for replacement in 30 year). It should be borne in mind that these are average figures. Annex 13 shows figures for all schemes. Figures vary from 500 to 4000kg paddy/ha/yr. As an illustration, the figures have been elaborated for the six schemes in Yen Tho (Bao Lam), which cost more than average due to higher transportation costs.

Table 11  O&M Costs Yen Tho Commune, Bao Lam District (based on 15 yr life time)

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Area</th>
<th>Cost</th>
<th>Cost/ha</th>
<th>Repair 2%/yr</th>
<th>Replace ment</th>
<th>Total O&amp;M</th>
<th>Total O&amp;M /yr/ha</th>
<th>Only Repairs/ yr/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ha</td>
<td>mill. VND</td>
<td>€</td>
<td>€/ha/yr</td>
<td>€/ha/yr</td>
<td>VND'000 kg paddy</td>
<td>kg paddy</td>
<td></td>
</tr>
<tr>
<td>Ban Pan</td>
<td>15</td>
<td>959</td>
<td>63,933</td>
<td>4,262</td>
<td>85</td>
<td>369</td>
<td>2,519</td>
<td>581</td>
</tr>
<tr>
<td>Ban Duoc</td>
<td>21</td>
<td>634</td>
<td>42,267</td>
<td>2,013</td>
<td>40</td>
<td>174</td>
<td>1,189</td>
<td>274</td>
</tr>
<tr>
<td>Na Vai</td>
<td>15</td>
<td>397</td>
<td>26,467</td>
<td>1,764</td>
<td>35</td>
<td>153</td>
<td>1,043</td>
<td>241</td>
</tr>
<tr>
<td>Dong Lung</td>
<td>12</td>
<td>410</td>
<td>27,333</td>
<td>2,278</td>
<td>46</td>
<td>197</td>
<td>1,346</td>
<td>311</td>
</tr>
<tr>
<td>Ban Chang I</td>
<td>22</td>
<td>570</td>
<td>38,000</td>
<td>1,727</td>
<td>35</td>
<td>150</td>
<td>1,021</td>
<td>236</td>
</tr>
<tr>
<td>Ban Chang II</td>
<td>26</td>
<td>1200</td>
<td>80,000</td>
<td>3,077</td>
<td>62</td>
<td>267</td>
<td>1,818</td>
<td>420</td>
</tr>
</tbody>
</table>

The mentioned amounts will only be borne by beneficiaries if they benefit so much that it is seen as a worthwhile investment, also covering the bad years. The estimate is that, if a 15-yr life time is taken, many schemes would not produce enough extra production to justify the investments. On basis of interviews with farmers and experience figures from elsewhere, farmers would never be ready or able to invest the average 1,182kg/ha/yr on O&M. For 727kg/ha/yr (30 year replacement) prospects will be better, but in reality even the 273kg/ha/yr will be experienced as very high by farmers who have never paid any irrigation fee at all and were never informed that such fee would be a consequence of accepting the sub-project.

In neighbouring Tuyen Quang Province water charges are recently raised to 700kg/ha/yr. This concerns a province with different leadership and much longer experience with irrigation fees. Also differences in the the prevalence of profitable double cropping in the province will influence the attitudes. Even Tuyen Quang farmers who are already used to high charges for many years, are said to find this very hard and expect that it is only possible for the first few years (ADB, 2002). Our calculations show that farmers of our schemes would have to pay nearly half of this for just repairs (in the 15-year lifespan case). The extra half can be saving, but is by far not enough to replace the scheme at the end of its 15-year life. The implication is that the government will have to bear the expenditures of replacement, i.e. €133 (VND 2 million) per ha per year, or $66 for 30-year replacement. This is also what villagers as well as DARD and project officials think will happen. The government has actually done this so far.

How much the government would have to spend on system O&M can be estimated from figures provided by DARD Bac Kan. DARD plans to concrete all the systems of the Province. There are 2243 schemes in that Province that may irrigate 25,000ha. Of these already 500 schemes have been upgraded already, irrigating 12,000ha at present.

For Bac Kan’s 25,000ha the Government of Vietnam would have to spend each year VND 50 billion or €3,333,333. The DARD engineer had calculated exactly the same figure but that included beside repair and rehabilitation also upgrading and new construction. This difference is possible as DARD only constructs weirs, while the official policy to line all canals is only implemented in projects like CBBC RDP. The total annual investment is far more than the present annual EU investment in the Province or sector. The government would not see much benefit for this in return and consequently would only be able to justify such investment as a social programme for the less poor in the hills. And not only would these expenditures have to be made in Bac Kan, but in all similar Provinces. At present this burden is not so high yet as fewer projects are completed, but once the O&M burden of the government starts to increase with the number of completed schemes, there will probably come a realisation that the Government can not continue the policy.
The end conclusion should be that the systems can be repaired for their lifetime, but that most will not be replaced after that, as it will be impossible for the beneficiaries and too costly for the Government.

3.4.4 Overall
The issue clearly deserves further study by both the Government of Vietnam and the EC. Within the context of this mission, it means that for the relevance of irrigation as a CBBCRDP-sector, the approach and technology will then have to change. This will be elaborated in the chapter on alternatives.

3.4.5 Need for More Data
The conclusions of this chapter are based on most reliable data and assumptions yet available. The accuracy of statements however still can benefit from more data and more observations. The project pay more attention to providing accessible baseline data and to monitoring of benefits. The following aspects brought up under this chapter might need more extensive study and data collection:

1. National policies and bases for policies
2. Food shortage per village
3. Factors contributing to food shortage and poverty
4. Irrigation potential in food shortage villages
5. Coping strategies in food shortage and otherwise poor villages
6. Underlying reasons for (lack of) interest in double cropping
7. Rice surpluses and sale patterns

The next mission would work on establishing a simple monitoring system that would allow the project more grip on the issues at hand. Indicators that might be arrived at after studying the above-mentioned aspects would probably include:

1. Food shortage
2. Wealth ranking among Communes and among Villages/ethnic groups
3. Double cropping potential
4. Rice prices
5. Rice trade
6. O&M costs per scheme
7. Irrigation fee payments
8. Maintenance condition
9. Operation (water saving, equitable distribution)

4 Alternatives
An alternative approach is not possible within CBBCRDP anymore as it is not equipped for this. Moreover, the project is in full speed on a very different track and should be allowed to run its course and book its achievements along that way. Only a few points will be given to indicate in which way irrigation might become justified for either social or economic reasons. Not all of these suggestions are proven for Vietnam and need testing and adjusting. Whether these suggestions will only be used for a next phase and other programmes or whether they will lead to some small experiment in CBBCRDP, depends on budget, staff and most importantly the importance that government, donor and project management pay to being well prepared for a next phase.

4.1 Making Irrigation Economically Justifiable
To make irrigation economically attractive, the cost of schemes and the cost of O&M has to come down. And the cost of investment should be related to the potential benefit. This will mean that the standard approach will have to be abandoned and solutions need to be tailored to local situations and potential benefit. Few suggestions, based on observations in Vietnam and experiences elsewhere, that can be considered on a case by case basis:

- Do less. The design of scheme upgrades should provide solutions for bottlenecks only. E.g.:
High seepage areas. Concrete lining of critical sections only. E.g. sections with high seepage rates (e.g. with Karst holes), sections where seepage is lost to uncultivated areas or sections in unstable land.

Stream crossings. These still need the same type of aqueducts, culverts and level crossings.

Unstable areas. These need still the same type of covered canals or pipe crossings.

- Cheaper solutions
  - Masonry weirs in sources that are very stable and small
  - Less wide weirs in small sources. At present small sources get weirs that are too wide.

- The weir or the concrete canal might be dropped completely. People in Yen Tho told that the canals are less important, while people in Tam Kim told that in some villages weirs could be omitted if other schemes could get canals for that money.

- In low-potential cases, people might be provided with cement only. DARD at present also supports many schemes like this. People provide labour and sometimes transport themselves. Small schemes in upland areas Thanh Long (Thong Nong District) benefited very much from this. One system of 1 ha received 80 bags cement @ €3 and another of 3ha got 320 bags €3. Costs per ha for the two schemes were therefore €240 and €320 only. Benefits were good. Costs would be higher for remoter areas.

- Not exclude all smallest schemes. The scheme list in Annex 10 also shows that the Global Workplan assumption that schemes get economically less feasible when they get smaller does hold, but only in a limited way as the table below shows. Even with the used technology, there are schemes of under 10ha that have costs of less than €1500/ha.

### Table 12  Size and Cost/ha

<table>
<thead>
<tr>
<th>Quartile</th>
<th>Area size</th>
<th>&lt;€1000/ha</th>
<th>€1001-2000/ha</th>
<th>€2001-3000/ha</th>
<th>&gt;€3000/ha</th>
<th>Average €/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st 25%</td>
<td>&lt;11ha</td>
<td>0%</td>
<td>62%</td>
<td>24%</td>
<td>14%</td>
<td>2,009</td>
</tr>
<tr>
<td>2nd 25%</td>
<td>12-15ha</td>
<td>5%</td>
<td>71%</td>
<td>19%</td>
<td>5%</td>
<td>1,557</td>
</tr>
<tr>
<td>3rd 25%</td>
<td>15-01ha</td>
<td>19%</td>
<td>67%</td>
<td>14%</td>
<td>0%</td>
<td>1,336</td>
</tr>
<tr>
<td>4th 25%</td>
<td>20-60ha</td>
<td>27%</td>
<td>64%</td>
<td>5%</td>
<td>5%</td>
<td>1,390</td>
</tr>
</tbody>
</table>

Note: “Area size” is taken as physical command area. Average €/ha (Cost per hectare) is taken for whole cropped area, where a double cropped 10ha is 20ha.

- In cases where the full area can be brought under double cropping and people are ready for high irrigation fees, still a concrete weir and concrete canal can be built. Examples might be schemes in Can Yen (TN) and Luc Binh (BT). There are even schemes without double cropping potential that have relatively low investment costs as can be seen in the Annex 10. Examples are Coc Bo (Co Ngan, HL) and Na Pet and Thua Thong (Xuan Trong, BLac).

- Most importantly, lower investments per scheme might mean that a second crop is not possible anymore, but does not mean that the benefit per invested Euro will be lower. It means that the same amount is spread over more schemes. In most cases this will be enough to trigger the potential yield and area increase. If the benefit from extra spring cropping and the benefit from summer yield and area increase relate to each other as 3:1, the same result is already achieved by three schemes of 1/3 of the cost. This is well possible. This has added advantages of risk spreading, easier repair and more equal spreading of benefits over Communes. See also text box in next chapter.

DARD appears to implement small-scale low-tech projects with own funds while reserving capital-intensive projects for donor-aid. One could also argue that small-scale low-tech projects are a more efficient

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8 Prices per bag of cement have not been checked in detail. People in Can Yen (TN, 3hr from Cao Bang) quoted VND 45,000. For Pac Mieu (BLam, 1 day drive) people quoted VND 100,000 and for upper Yen Tho (1.5 day drive and 0.5 day walk) VND 300,000. Travel times are given for project vehicle and walk without load. Trucks and loaded porters or animals probably will take twice as much time

9 Some cost figures might be misleading as especially in Bac Kan the project did not have to build the weir, which was already built by DARD in many cases.
use of funds and that donor funds firstly should be used for an expansion of DARD's programme for small low-tech projects, as the scope for this is considerable.

4.2 Making Irrigation Socially Justifiable

To make irrigation socially attractive, it has to benefit at least all sections of the population equally, and should preferably reach the food shortage villages. The two small and cheap schemes in upper Thanh Long Commune (TN) show that this is very feasible. Travel distances are also not much longer for these villages. Most uphill villages can be reached within half to one hour from the presently selected schemes.

- The presently used identification and feasibility study process will have to be adjusted in line with GWP intentions. The project will have to be equipped for this.
- The main act of planning should shift from district and project to the Commune. Communes are well, if not better, able to identify the problems, the deserving villages and the possibilities for development. Also experiences of Helvetas/DARD/DPC in Cao Bang show this.
- As projects working with this approach (many international projects and few in Vietnam (e.g. Helvetas Cao Bang)) show, this will lead to smaller projects and benefits being spread over more villages. If villagers themselves are responsible, harmony in the Commune becomes an important factor. No leader wants to be seen keeping projects for themselves. That this happens in CBBCRDP is because the planning process is not truly participatory and open, and because Commune leaders can point out that actually the project selects and that the selection criteria work against projects in poorer villages.

Illustrative Example

For example (hypothetical case) there are 50 schemes of average 20ha (30hh) with identical stream crossing problems. Production can be increased in each with only 2% (equal to 0.4ha) by providing 12meter-aqueducts for a total of €20,000 (=50*€400). This will give a net benefit of 20ha (=50*0.4ha) extra production.

This compares well with a system of 20ha (30hh) that by investing €40,000 (20*CBBCRDP’s average €2000/ha) achieves the same extra 20ha (a doubling of production) by double cropping and yield increase. The added advantages of reaching 1500hh instead of 30hh and spreading of risks over more communities also weigh in favour of multiple low inputs above a single high input.

- Many international programmes have found that investing in multiple low-input-low-output sub-projects can easily equal the output from investing in much fewer high-input-high-output sub-projects. Many small projects can be more labour-intensive for a project, but have a few other big advantages. They lead to socially more feasible projects, to lower risks and as they are smaller and more manageable, to higher sustainability. They also can result in a higher overall output. The extra administration might be lighter than the heavy paperload the EC demands for work with contractors and consultants.
- Where costs are higher still, more of design and implementation can be left to villagers (Thanh Long, Helvetas). This will bring down the costs, as villagers do the same thing cheaper than consultants and contractors and if the intervention and design is simple, without much quality problems.
- The approach that includes elements as outlined above, will need software staff beside hardware engineers. These might be community workers or Commune staff supported by Community development staff. The ensuing costs will be lower than the savings on design consultants and contractors, which will be needed in fewer cases. As also intervention costs are at average lower, more projects can be implemented for the same money.

In case these adjustments are not sufficient, investments should shift to other sectors.

More detailed information will be needed on the following:

1. Calculations on benefit-cost relations under various designs and conditions
2. Seepage, losses, lateral groundwater flows, percolation.
3. Efficiency of projects built by local people with donated cement
4. Detailed calculations of what is needed in terms of staff, time and funds for alternative approaches to achieve the same output as CBBCRDP.
5. Experiences from other projects that work through Commune level planning processes
6. More experiences from elsewhere on different technologies
5 Operation and Maintenance (A & B)

The project has made most decisions on operation and maintenance (O&M) already by way of the approach and technologies it has chosen. It has just embarked on a programme to ensure better O&M by formulating policies and by training of Water User Associations (WUA) and related government agencies. The assumptions have to be the following:

1. People can be sufficiently organized and trained to properly maintain concrete weirs and canals.
2. People and/or government have the financial capability to maintain the systems as constructed.

To what degree these assumptions are right should be established first by assessing how people do O&M and what problems and needs the upgraded schemes brings along. More importantly this assessment will help the WUA support programme, which will be guided by the contracted party CWE, in devising policies and preparing trainings.

5.1 O&M In The Existing Situation

Knowing the existing situation is essential for two reasons. Firstly, it is important to know from where people have to come, before you ask them to change. Secondly, people in a change situation never adopt all the newly promoted and trained ways and will keep at least some of the old ways. Moreover they will also revert to these old ways whenever they feel the new ways do not suit them. So, the art of introducing any change is to make that change from the existing situation as minimal as possible.

The existing situation in practically all irrigation systems in the project districts of the two Provinces is as follows. The majority of systems in the project districts cover only one village. The Head of the village is the system manager. If a village is big, like many Tay villages, major decisions are taken in meetings. For some areas with much Party presence, the Party Cell takes these decisions. Day-to-day management is done by those who are irrigating that day, guided by the Village Head when needed.

For major maintenance activities like cleaning the canal, removing vegetation from the canal bed and dykes or the repair of the brushwood boulder weir, the Headman calls a meeting, in which is decided the timing and the number of labour days each household has to provide. The most substantial single event repair concerns the weir that breaks down during floods. Farmers say it varies from zero to five times a year. Two times yearly was mentioned most often as the average. It will take all households about three mandays per time.

It depends much on the household situation who is sent. Men and women work equally, except for the heavy work in the water on the weir, which is mainly men’s work. Operation is done by those who irrigate at that moment. No rotation systems were observed, which is not surprising as no water shortages are felt in the wet season, while most systems do not irrigate in the dry season. The only system where special arrangements were observed was water-shortage Ban Dau (Thanh Long, TN). Farmers close to the canal could irrigate one hour at a time and the farther away ones got two hours per turn. See figure.

![Irrigation Scheduling, Ban Dau, Thanh Long Commune, Thong Nong District](image)

Villagers irrigate in mutual understanding. If a family has its act together faster or decides to start cultivation earlier than others, they will irrigate earlier. The number of households for one system is small enough to make a system possible that is based on principles of first-come-first-serve and mutual
understanding. Families that are poorer or have labour problems due to illness or absence of males might be at a disadvantage in this situation, but their fate depends more on leadership and sense of community than on sophistication of water distribution systems. The villages visited appeared strong communities that cooperated well and cared for each other.

There are very few Water User Associations in the area. One or two were formed under a CIDSE programme in Bac Kan in the 1990’s. The locations of these came to the knowledge too late for this mission to visit and study the present situation. Another was said to exist in Ban Gai (Can Yen, Thong Nong District), where DARD had started upgrading the system in 1998, but never completed it. The interviewed Commune leader did not feel any difference with the earlier non-WUA situation. The fact that the system was incomplete and actually damaged again will not have helped.

Normally, where the need arises people start to organise themselves. This is a natural process and has only started recently in the project area, considering that only one spontaneously formed WUA was found. This was a very new WUA in Luc Binh Commune (Bac Kan Province). See box.

### One of the first WUA in the CBRCRD Project Area

**The Na Chuong water management group with no name (27.8.02), Luc Binh, Bac Kan**

Na Chuong people formed a 5-member group for an ADB-assisted scheme (2 year old, 2km, 100ha, 47hh in Na Chuong, many in Ha Vi Commune) as this is big scheme, covering 2 communes. It has some maintenance problems, partly due to bad work, partly due to river erosion.

Initiative came from the Party Committee meeting. Nobody from ADB or DARD office came ever to discuss O&M.

The contractor during hand-over only said: “Now it’s yours. Please maintain it well”. They also never heard of any other WUA.

The group adjusts the canal discharge by operating intake gates and outlets, keeps canal free of obstructions and clears landslides, and repairs river erosion damage. Every day some or all five go along the canal.

Compensation: The village meeting in June decided for 15kg paddy/ha land per year. This is not enough, they see now, for repairs and their labour. They plan to raise but not now as village has only recently agreed with 15kg and would not be ready for more. They have not yet collected, so work actually voluntarily and see what happens at harvest time.

Women and men worked equally hard, but after the upgrade men work more. They see no reason to have women in the group. They used to call all (1 person per hh) for major works, but have not had to do so since new scheme is there.

The Group keeps records (even of the meeting with the interviewers). They would like to be supported with training on management and repair skills. Even one person trained can help.

The downstream Ha Vi people were not involved. Some water shortage was reported at tail end and discussed by them with Na Chuong. They have now agreed to send also people for maintenance of first section. Nobody discussed yet whether Ha Vi people should form own WUA or join the Na Chuong WUA.

O&M Practices of several schemes in the area have been tabulated for comparison with schemes in Son La Lai Chau in Annex 15, page 1.

### 5.2 O&M In The New Situation

5.2.1 Changes

The changes that often occur after a local system is replaced by concrete weirs and concrete canals are substantial:

a) From frequent small repairs to fewer but bigger works

- Repair to the weir changes from six days per year struggling with bamboo, boulders and earth and regular touching up of gaps and breaches to a complete replacement only once in 15-20 years and maybe in between some cement masonry repair to damaged side walls and regular opening of the middle spillway to flush sand.

b) From simple works done by all (areas, sexes, social strata) to complexer works needing special skills

- Where a local weir benefits from silt deposits, concrete weirs have to have sand gates and silt traps that need to be opened and cleaned regularly to avoid silting up of the upstream of the weir and the canal itself
- If new canals have a closable intake gate and a silt trap, siltation can be avoided, but this needs active gate operation especially during floods.
- The permanent weir has been seen to affect the stream course, causing river erosion on the first canal sections along the stream. Protection needs extra attention
- Outlet gates need management
- Canals can be dammed and blocked more easily and inspection against misuse and obstacles needs to be more regular.
- Where water users would all regularly be involved in repairs of e.g. the weirs, everybody could regularly ensure its rights by labour contribution. With the new more permanent weirs, joint work on repairs decreases. Especially tail-enders thus tend to lose partly control as organisations and operation tend to be get dominated by the upstream users.

(c) From works done completely in village labour to works done mostly by paid labour

d) From works that can be done any time to works that need time to organize
- The irrigated area increases and cropping intensity increase. This increases the need for organisation and labour, and changes the families’ labour regime in the dry season.
- Where practically everybody could start repair of damages any time, repairs to upgraded canals need materials and skills that are often not available in the village. This necessitates higher levels of management to ensure timely availability of funds, materials and skilled labour during emergencies.

(e) From works that need only organization of labour to works that need organization of funds and skills as well

5.2.2 Physical O&M Problems
The O&M problems that are most probable to occur in the new schemes

1. Damage
   a. Damage and bypassing of the weir by the stream or river
   b. River erosion to first canal section
   c. Landslide on top of canal
   d. Leakage through cracks

2. Inefficient Use
   a. Obstacles in canal: silt, stones, rubbish, unauthorized hydro installations or laundry provisions
   b. Uncontrolled water flow through unclosed gates, manmade extra outlets

Such O&M Problems, or even a single maintenance bottleneck, can reduce the discharge for the whole canal, resulting in reduced yields and area:
   a. Less water, especially for tail end
   b. Overflow causing more damage and drainage problems
   c. Flood damage to crops (too much water, sand, silt)
   d. Increase in maintenance labour
   e. Increase in conflicts

5.2.3 Beneficiaries’ Tasks in O&M
Beneficiaries duties will be as follows:
1. Checking system every day, removing debris and other obstacles from canal, making small repairs, keeping cattle away from the canal, checking on misuse and encroachment
2. Seasonal cleaning of silt from canal, cutting and removing vegetation
3. Canal repair that can be done by few people
4. Small weir repair
5. Major repairs
6. Collect fees, mobilise Commune
7. Opening and closing of gates, outlets
8. Conflict resolution

5.2.4 Which Institutional Problems to Solve
The farmers face the following institutional problems:
1. Rights and responsibilities
   - Within the WUA which village and/or household is entitled to what and will contribute how much?
2. Roles within Village and WUA
• Do we need full time specialized persons like operators, bookkeepers, chairman?
• How do these people relate to each other and to the village?
• What organization form we need?
• How do we organize ourselves?

3. Resource Mobilisation
• Who is going to pay for which repairs?
• Who will collect and manage fees?
• Who will spend fees and how?

4. Support by Outsiders
• Do we need new skills: book keeping, fund mobilisation, organisation, record keeping, construction skills, quality control, management, water management for improved agriculture
• How will we acquire these skills?
• Who will help us if we need to upgrade our skills later?
• Are we entitled to outside support (Commune, District) and how can we claim that support?

All these things will be decided or done during the WUA establishment and support programme. The chapters below outline some of the issues and possible achievements.

5.3 O&M Issues

5.3.1 Legal Framework and WUA Policy
The legal framework needed for WUAs to properly function is in Vietnam not complete and uniform yet. Provincial policies however can fill the gaps and the upcoming support programme will start with a policy formulation exercise that should lead to each Provincial DARD issuing a regulation on Water User Associations. Many other Provinces have already done this.
When devising this policy the following will be highly advisable:
1. Base it on existing structures
2. Keep it as simple as possible:
3. Don’t create new bureaucracy
4. Don’t add to burden of village and GoV

Chapter 5.4.5 will further elaborate this.

5.3.2 The Institutional Framework
Any framework should be built on strengths and any support programme should focus on weaknesses. It is therefore important to assess the actors in the institutional framework and their strengths and weaknesses. Table 13 shows which actors are involved in which stage and how much and Table 14 shows strengths and weaknesses of the relevant actors that might be involved in O&M once the project terminates.
Table 13  Actors in CBBCRDP Sub-Project O&M During Each Stage

<table>
<thead>
<tr>
<th>Key Actors</th>
<th>Before Project</th>
<th>During Project</th>
<th>After Project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construct System</td>
<td>Distribute Water</td>
<td>Maintain Facilities</td>
</tr>
<tr>
<td>Village</td>
<td>Xx</td>
<td>x</td>
<td>Xx</td>
</tr>
<tr>
<td>Village Headman</td>
<td>Xx</td>
<td>xxx</td>
<td>Xx</td>
</tr>
<tr>
<td>Commune Committee</td>
<td>X</td>
<td>X</td>
<td>xxx</td>
</tr>
<tr>
<td>DPC &amp; PPC</td>
<td>x</td>
<td>xx</td>
<td>xxx</td>
</tr>
<tr>
<td>DARD</td>
<td></td>
<td></td>
<td>xxx</td>
</tr>
<tr>
<td>Project CBBC</td>
<td></td>
<td></td>
<td>xxx</td>
</tr>
<tr>
<td>Consultants &amp; Contractors</td>
<td></td>
<td></td>
<td>xxx</td>
</tr>
</tbody>
</table>

Note: xxx means much involvement, x means some involvement.

Table 14  Strengths and Weaknesses, O&M Actors at Commune Level

<table>
<thead>
<tr>
<th></th>
<th>Direct Interest</th>
<th>Presence @ site</th>
<th>No Other occupation</th>
<th>Management Skill</th>
<th>Technical Skill</th>
<th>Access to support</th>
<th>Decision making power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users</td>
<td>*****</td>
<td>*****</td>
<td>*****</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Informal canal leader</td>
<td>*****</td>
<td>*****</td>
<td>*****</td>
<td>**</td>
<td>**</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Village Head/Village Coop**</td>
<td>*****</td>
<td>*****</td>
<td>*****</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Village Party Cell*</td>
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<td>***</td>
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<tr>
<td>Irrigation Management Board*</td>
<td>***</td>
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<td>***</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Proj.Man.Brd/Comm. Coop*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>***</td>
<td>**</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Commune Committee*</td>
<td>*</td>
<td>*</td>
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<tr>
<td>Commune Council/Party Cell*</td>
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<td>****</td>
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<tr>
<td>Contractor</td>
<td>*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>****</td>
<td>*</td>
</tr>
<tr>
<td>District PC and DARD</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>*****</td>
<td>*****</td>
<td>*****</td>
<td>*****</td>
</tr>
</tbody>
</table>

Note 1: In case members of these institutions are direct users of any scheme in the Commune, which often happens, their direct interest and presence at site will be higher, but only for that particular scheme.

Note 2: Access and influence increase in case a village is located geographically closer to the Commune or District Head Quarters/Centre or if senior officials of Commune Committee or Party are direct users of the scheme.

Whereas as many responsibilities as possible should remain with the village, i.e. WUA, the WUA will need the strengths of other more educated, experienced and influential actors to overcome their weaknesses. They will need the Commune staff for financial management and technical support and will need technical support for bigger repairs from the District.

One of the biggest issues will be the irrigation fees, bank account and who manages these. Some other older models leave these with the districts, as Communies even now do not manage bank accounts for project implementation. This should be avoided at any cost, as distancing the funds from the actual users will lead to inefficient use and unnecessary overhead. It will be preferable for the WUAs themselves to manage these irrigation fees and bank accounts as happens in nearly all Asian countries. However, in a situation where even the Commune does not manage a bank account, this would be probably a too big step. Other organisations work with introduction of Commune bank accounts and even in the project area positive experiences are seen with this. The process needs careful introduction and much support, as WUAs can be greatly demotivated by any extra costs for management of their funds by third parties, by any sluggishness from these third parties and by any inefficiency in spending their funds. The accounts for one thing need to keep the money of different villages separate.
Several other models have been proposed or implemented under DARD and/or PPC in other hill Provinces. Most relevant are those found for Son La, Lai Chau, Ha Tinh, Yen Bhai and Tuyen Quang. Some of these policies were collected and others were derived from reports of CWE, SLLC (EU), Action Aid, CIDSE, Water Sector Support Programme (DANIDA), ADB, Helvetas and others. Also experiences are gained from what people actually do with the new projects, as for example described extensively in the reports on systems in Son La Lai Chau (SLLC RDP) and Ha Tinh (OXFAM Hong Kong). See the list of consulted documents in the Annex 19. The various models have been compared in the O&M Models table, which is attached as Annex 15, page 2.

Most relevant will be the regulations recently introduced for SLLCRDP schemes and the experiences from neighbouring Tuyen Quang. CBBCRDP and Provincial DARDs can learn from these, by studying them while devising policies.

5.3.3 Gender in Irrigation

The Gender Issue report (CBBC RDP, 1999) raises gender issues in irrigation, stating a case for more involvement of women in all phases of irrigation projects. The ToR for this mission therefore requests to ensure that gender issues are effectively integrated in all plans, strategies and measures under the overall ToR.

Gender in irrigation should be looked at in more detail, to make practical recommendations. The said report bases its case on statements that up to 75% of irrigation work is done by women. In each of the villages visited under this mission the issue has been raised. Generally the men and women interviewed agree that women and men work equally in irrigation related jobs, except for weir reconstruction which takes at average 2 times 3 mandays per year. This would lead to 55% men-45% women involvement in O&M. Also the 45% share in irrigation-related labour should be qualified as most of the work is related to water use and less to management and repair. Two consulted reports helped put the findings in context.

The ADB report makes the following observations:

- With mechanisation, including upgrading irrigation systems, the role of men increases and of women decreases. The result is that irrigation related jobs are 70-80% done by men after upgrading. Planning and decision making (cropping, sowing times, irrigation schedule, sale of surplus) also shifts to men (80-100%)
- Men decide more on cultivation periods and timing and crop varieties
- Women still decide more on time and work related to seed bed preparation, transplanting, weeding and pest control
- The overall irrigation rotation schedule is decided by the village or cooperation. Within this broad framework, women make more decisions on detailed timing and scheduling than men. (Note AvR: the former is a typical WUA-job, the latter of those who irrigate at a certain time)
- Women are hardly represented in political and village decision making structures. They form of course 100% of the Women’s Union, but around 10-50% of the Youth Union and are rarely represented in the Cooperation or Commune staff. (Note AvR: and in the Party leadership)
- Women are in practice therefore more Water Users and less Water Managers

The OXFAM HK report makes the following observations:

1. OXFAM has worked hard to involve women in preparation, construction and monitoring. Sometimes 60% of meeting participants were women. But in the end at most 15% of functionaries were women and not in higher positions.
2. The reasons cited for the small number of involved women: managing water and collecting fees is traditionally a men’s job. This type of job needs status and spare time, both of which men have more. Moreover men think women have more difficulty with aspects like night irrigation or enforcing rules on e.g. grown-up boys whose cattle eat rice or damage embankments.

"Impacts of Small-scale irrigation systems in two Communes in Ha Tinh Province" (Dr Ha Luong Thuan, Koos Neefjes et al, OXFAM Hongkong, May 2002) and “Study on gender and Development –RETA 5889, 8 Communes in Yen Bai Province” (Nguyen Thi Phuong Lam, ADB, April 2002)
3. All important positions in the management systems are occupied by men and women water users can therefore only address men for their problems. In water shortage situations, especially at the tail end irrigating women, and more so those of female-headed households, have much more problem to get water to their fields than men who are irrigating in the same area: ‘If water is short and both a man and a woman come for water, usually the man gets priority, because men can easily talk to men’

4. Generally men and women agree however that overall women can do operation and canal maintenance jobs well

All these observations fit with observations and interviews made during this mission’s field trips. They are valid and important for O&M in CBBC-supported schemes. The conclusions are:

1. That in reality most O&M work and especially most decision making is done by men.
2. That women after upgrading will not play an equal role in O&M labour anymore
3. That women are still more important water users than men
4. That women, especially those in water shortage risk areas, need extra support from management level
5. That support for women can only be ensured by inclusion of a quota for women in management organisations. A quota of 20-30% will suffice, i.e. for most one-village systems one female WUA member.
6. That besides the obvious choice for members from the Women’s Union, care should be taken to include poor women and women who head their households (women whose husband lives elsewhere, widows, single women, divorcees)
7. That without specific project support (extra staff, training, funds, time) such representation will not be realised in a meaningful way.
   - One staff member of the WUA-support and training team should be female. This staff member can be part of the WUA consultant’s team or an addition by the project.
   - Women WUA members need extra training of 1-2 days before they are trained in as members of the whole WUA
   - WUA members’ training need a one hour session on the need for women quota and gender policy
   - Exchange programmes of CBBC’s WUA-women with those in irrigation schemes assisted by NGOs might be appropriate

5.3.4 Resource Mobilisation

Assuming that villagers will not be able and ready to pay for replacement, the repair burden for villagers will remain at average 273 kg paddy per ha per year. This is just to keep the canal running and to save for bigger repairs.

Experiences elsewhere indicate that it will take a long time and vigorous leadership and support, before such irrigation fees are realised. The problems lying ahead can be imagined on basis of few observations.

- The organisation with most experience in levying irrigation fees is the Provincial Irrigation Management Company. The IMC has not been able to collect anywhere close to such amounts in Irrigation Management Company-managed schemes. They state that they are able to collect on average only 30% of the fees. The government generally fills the budget gap that the IMC needs for running its organisation. For neighbouring Tuyen Quang Province (3800ha*200kg/ha/yr) this IMC figure is stated to be 60%, but also this only enough for staff, management and small repairs.
- The new self-organised WUA of Na Chuong in Luc Bing Commune, Bac Kan, started with only 15 kg paddy/ha/yr, which was the maximum that the village meeting would accept, whereas the WUA would need about 400kg/ha/year to cover all annual maintenance cost and maybe another 800 kg/ha/yr to save for the ultimate replacement of the whole scheme in 15 years.
The Provincial DARD in Lai Chau had issued a policy for irrigation fees of 170kg/ha/yr, but very few schemes have started paying these fees yet.

In people-managed schemes the prospects are better, as Tuyen Quang has shown. However the benefits must be very high and the time for people to adjust to the situation and to strengthen their organisations is long. In Tuyen Quang there is a policy and programme in place since 1996. With strong Provincial leadership and some outside support the government has been able to turn the situation around and in farmer-managed systems people pay now full fees. Sometimes farmers pay a few years of fee ahead to finance big investments. Often management of these schemes falls under management boards of agricultural cooperatives (ACO). Feasibility of this model is not sure for CBBCRDP’s project Communes, where no such (old or new) cooperatives were found.

In any case CBBCRDP should be ready for a programme of training and vigorous encouragement for all WUAs and then still allow time for the WUAs to bring policies like paying irrigation fees in to practice.

5.4 Advice on Programme for WUA Formation and Assistance

The Centre for Water and Environment has been contracted to implement a programme for policy making, formation and training of Water User Associations (WUA). Advices specific to activities under this programme can be given on basis of the observations in the chapters above.

Most of the activities are already designed and some are tested by CWE under other circumstances, for example the initial training course and O&M assessment by participants. Again others will be decided during the course of the programme, e.g. the contents of the guidelines and policies or the type and location of irrigation and watersupply systems for assessment. In that sense it is a process approach, for which neither blueprint schedules nor very specific demands can be given. An attempt at a schedule, based on CWE’s proposal and discussions, is given in Annex 16. As the progress depends on external factors, especially DARD decision making processes, the schedule can not be fixed and the annexed schedule should be seen as something in between the most optimistic and most realistic case.

Some remarks and suggestions on general matters are given in the following chapters.

5.4.1 Selection of workshop participants

The participants have already been selected. They consist of DARD and DPC officials and PMU staff.

5.4.2 Selection of trainers

During the meetings early September already it was decided that for each district a team of one engineer and one agricultural extensionist would be most suitable. The engineers are needed for technical matters and training subjects, while the extensionists will bring in their experience with farmers, organizing farmers and trainings. In Figure 8 an example of a District Office is given. Each box indicates a senior or middle cadre specialist staff member. Bold borders indicate what would be potential trainers Other DARD district offices were noted to be slightly different in structure and personnel strength, but not in essence.
The engineers will need training on training methods and dealing with farmers, while the extensionists will need at least some orientation on irrigation and technical engineering matters. Care should be taken to coordinate with the project’s own agricultural and forestry components on the involvement of staff that they also depend on.

5.4.3 Selection of Guiders

The Commune has various possibilities for this, which CWE and the project should be aware of.

- a) Vice Chairman for agriculture and infrastructure
- b) Commune Extension Worker (GoV paid)
- c) GoV-paid Village Extension Worker (Cao Bang Communes only)
- d) CBBCRDP-paid Village Extension Worker (project villages of Cao Bang and Bac Kan)
- e) Commune Women’s Union leaders
- f) Commune Farmers’ Association leaders
- g) DARDO Commune-level Extension staff

An example of the structure of Communes has been given in Annex 14. The quality and availability varies a lot per Commune and District. Selection will be left to ADO in consultation with Commune, who will themselves assess the most suitable candidates. Care should be taken to coordinate beforehand with the project’s own agricultural and forestry components, which might have their own preferences for getting their own trained extension workers involved or not involved. They also will have insight in the staffing and management situation of “their” districts. The only Communes that have infrastructure as well as agriculture and/or forestry activities are given below. Annex 17 gives details for each Commune where any of the sectors is working at present. Both agriculture and forestry components indicated they were moving to new Communes in future.
Table 15  Where Infrastructure Meets Other Sectors

<table>
<thead>
<tr>
<th>Commune</th>
<th>District</th>
<th>Irrigation</th>
<th>Watersupply</th>
<th>Road</th>
<th>Agriculture</th>
<th>Forestry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thuong Ha</td>
<td>Bao Lac</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Khanh Xuan</td>
<td>Bao Lac</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>Can Yen</td>
<td>Thong Nong</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>Ngoc Dong</td>
<td>Thong Nong</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Minh Long</td>
<td>Ha Lang</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Thang Loi</td>
<td>Ha Lang</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Dong Loan</td>
<td>Ha Lang</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>District</td>
<td>Ngan Son</td>
<td>10</td>
<td>13</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>

5.4.4  Selection of study and assessment sites
Assessing the project’s own systems will work best, besides visits to the few systems that have formed their own WUAs, e.g. Luc Binh and Cao Ky in Bac Kan. A representative sample will include schemes of all districts, from remote and accessible communes, poor and less poor Communes, schemes with less and more O&M problems
DARD’s other types of schemes could also be considered, especially for assessments by trainers of non-project districts, if any. This concerns especially bigger and medium-scale systems that are mostly managed by the Irrigation Management Company. Some of these might be slated for hand-over to beneficiaries.

5.4.5  Policy
In view of what DARDs in other Provinces have devised as policies, one need not much worry about the outcome of the policy making process, especially where guidance of CWE is available. The policies accepted in SLLC would already do quite well for CBBCRDP schemes. However it is opportune to repeat a few basics:

1)  Base the regulations/policy and promoted WUA on existing organizational structures
The existing structure is the Village, the Village Head and the Commune. This skeleton provides a useful framework for management of the upgraded systems, too.

2)  Keep it as simple as possible
The skeleton framework should only be made more complex if absolutely necessary.

-  In small systems/villages, one might consider naming the whole village the WUA with the Village Head as its only functionary. This guarantees continuity and avoids the risk that the management transfers to a limited number of hands excluding others from information and influence.
-  If an executive body is formed, semi-annual meetings with all members will be needed to maintain accountability
-  Obviously if fee collection is involved, a second functionary at village level like an accountant is needed. Not only to decrease the Head’s workload, but to maintain accountability. The one who approves expenditures and the one who makes them should ideally be different persons.
-  The bigger or more complex the system or the village, the more will be the workload and the more logical it will be to consider extra positions. An attempt at showing in which way WUAs might develop after upgrading is given through organizational charts in Annex 18.
-  If more than one village is involved, a platform is needed in which representatives from each village can discuss matters with each other.
-  For the rest it should be left to the beneficiaries whether to add positions:
  -  If much operation of gates and if regular checking of the canal is time consuming, operators might be assigned.
  -  In case the Village Head is sometimes absent or not always in good health, a Vice-Head might be appointed.

11 Systems covering more than one Commune do not need to be considered as none exists in the CBBCRDP context.
In case managing the system is much work, another person than the Village Head might be elected as WUA Chairman. It is wise then to make the Head an ex-officio member.

- In more complex bigger systems introducing extra levels might be needed, e.g. main WUA and sub-WUAs for each village. Normally one operator or village head would suffice.
- Normally the Commune People’s Committee assists with monitoring, advice and with O&M construction works that require budget or materials from outside the Commune. Also the WUA account will be kept at Commune level, probably as a Commune Account at District level but with the system’s name. In Communes with sizeable systems or with many systems, the duties of Commune might go beyond what a village can normally expect from a Commune. Then an extra level might be created at Commune Level in the form of e.g. a Project Management Board, who receive a percentage of the irrigation fee in exchange for assistance in account keeping, assistance with resource mobilization, procurement, monitoring, regulation enforcement.

3) Avoid creating new bureaucracy
It is natural for projects and government agencies while creating new institutions to provide solutions for each and every possibility and as a result propose elaborate rules on responsibilities, meeting schedules, record keeping and procedures. However experience is that, wherever such is done, most of these are in practice not followed or even not read at all by villagers. The shift from no written regulations to such elaborated ones is too big. Staying close to how such regulations evolve naturally has more chance of success. The art is in limiting the prescriptions in terms of regulations, meetings, record keeping, and approval procedures.
Most of these aspects of a WUA will evolve by themselves over time and only if villagers find them necessary. Unlike projects and government agencies, villages have many unwritten rules and customs. Moreover regulations are less necessary as villages normally work through harmony, mutual understanding ands social control. Newly introduced written Rules are best kept if they are limited to things that people are not doing yet. A good example are the regulations issued by the Luc Binh Party Committee and Commune People’s Committee for all irrigation systems.

### Luc Binh Commune Regulations on Canal O&M
- Don’t use explosives for fishing within the weir area
- Don’t open gates without authorisation
- Don’t dig within 2m of the weir and within 1.5 m of the canal
- Don’t remove slabs on the canals
- Don’t pollute the canal water by discharging of waste or soil
- Don’t block the canal or make holes in the canal wall

Any violation of this regulation will be legally prosecuted

(The instructions were sent June’02 to all Headmen to read out to villagers)

Earlier in April 2002 the Commune People’s Committee issued a decision that all villages must form Canal & Weir Protection and Management Units of 3-5 persons. These would have to formulate their own rules on water use, repairs, cleaning and irrigation fee. The units will be held responsible for implementing the rules.

The one page with few rules issued concentrate on the need to change behaviour in relation to a new situation, i.e. having a concrete canal: no digging next to canal, no grazing cattle and report damages that the village itself cannot handle. In one case the villagers decided to organize themselves and introduce some fees.

4) Don’t add to burden of village or Government
a) Let irrigation fees depend as much as possible on village decisions and actual O&M needs.
It is most manageable for a project like CBBCRDP or DARD to initiate uniform irrigation fees for all systems. In case any payments from Commune to the District are involved, such is even unavoidable as varying fees will result in an unmanageable collection system. However in the case of most systems, O&M will be paid for and managed within the Commune without payments to the District. Variation of fees is thus possible.

Avoiding uniform Irrigation Fees will increase the probability that they are paid. Therefore the O&M and replacement costs should be calculated for each system separately by DARD and discussed with the villagers. Some systems might need an irrigation fee that is double that of other systems. This depends on the command area size, the construction cost and the actual benefit. The effect of upgrading might vary from 20% extra summer crop production or 20% extra summer crop area to summer production increase plus an extra crop in Spring. The latter systems will be ready to pay high fees, but the first ones not.

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Figure 9 Uniform Irrigation Fees

The Fees needed to meet annual maintenance and to rehabilitate the whole system in 15-20 years should be calculated in a simple way with the villagers together. The consequences of paying higher or lower fees should be discussed with them. Then they can choose and the Government can adjust its commitment accordingly. A village willing to pay high fees that are sufficient for repairs and rehabilitation should get the government’s priority commitment of assistance in crisis times. A village not willing to pay high fees, should understand that in times of crisis the government will be less able and likely to assist them.

Ideally this should have been done before project selection, as in the present situation some villages might feel burdened with O&M obligations which they had not been aware of at the beginning.

b) Don’t burden GoV with maintenance that can not be done if many more schemes are built country-wide
Whatever policy is put in place, it should allow the Government to bear the consequences if it would be applied to all similar schemes in similar Provinces or even the whole country. The Government should agree to the policies.

c) Don’t make village unnecessarily dependent on Commune or GoV
As even Commune do not have their own bank accounts from which to implement activities, it will be probably too big a step for Villages or WUAs to have their own account. The first priority should be to help Communes open and manage their own accounts. WUAs will work through these. But with each step in the process it should be realized that sooner or later WUAs will have to have their own accounts and obstacles to that should not be created.

d) Keep Regulations flexible
Very probably WUAs will like to copy or use a standard example provided by DARD/PMU, but they should be allowed to write and amend their own regulations.

5.4.6 Writing instructions, Trainings materials, contents, Training style, methods
Instructions, materials and methods should be like for any other training activity: short, simple language, concise.
5.4.7 Non-CBBCRDP sites
The Provincial authorities will formulate policies that will be applied to all irrigation and watersupply schemes in their Province. The project should consider whether to support DARD’s efforts for the non-CBBCRDP schemes also. This would be a meaningful contribution to agricultural development in the project area and bring consistency.
6 What Next

October 2002 – February 2003: Infrastructure Section and CWE

- The project staff will comment critically on the draft report, check validity of statements and find answers to questions when visiting the field or seminars and workshops
- CWE will continue to guide the WUA Programme
- Infrastructure section will start and complete more works
- Infrastructure section will complete SPOF data processing and update other sub-project data
- The project will employ two DARD secondees
  - They will function as O&M engineers/officers, dealing with any CBBCRDP O&M activities
  - They will facilitate CWE in executing WUA Programme, e.g. logistics or liaison between CWE, DARD, two PMUs and the districts
  - They will act as trainers in the WUA programme in sites with trainer shortage
  - They will monitor field-level WUA programme trainings and support activities
  - They will continue follow-up WUA support after CWE’s contract expires
    - Any Support and training left for CBBCRDP sites
    - Support and training for non-CBBCRDP sites, if such programme is decided
- The infrastructure section should obtain Bang Giang discharge data (CBBCRDP has water levels, not discharges yet) and smaller rivers if available

Early March – Early April 2003 (1-1.5 months): Short-term Specialist Mission-2

1. Finetune findings of first mission
   a. Crop Areas, Intensities and Yields
      i. Study water availability on all sites during dry season
         1. Source discharge in March-April
         2. Second crop in completed sites and other concreted DARD-sites
         3. Water rights between upstream and downstream in double cropping areas
         4. Water efficiencies in canals in dry season. Run canal, measure discharges
         5. Outlet location review in completed sites
         6. Tail end water availability in completed sites
         7. Study Bang Giang discharge data
      ii. Update estimates for double cropping potential
      iii. Formulate and update output indicators
   b. Study potential of irrigation relief for food shortage areas
   c. Study potential for rice as cash crop
   d. Formulate selection criteria for different technologies for future programmes
   e. Collect experiences with more simple and cheap technologies.
   f. Formulate and initiate experiments with simple technologies
   g. Inspect completed sites and allow minor additions, where really necessary, like bank protection, extended guide bunds, silt traps. It is not advisable to add already during design stage as this will cause delays.
   h. Study O&M in older Tuyen Quang systems

2. Monitor and Support WUA support programme
   a. Discuss progress and problems
   b. Attend trainings and comment
   c. Advice project management on any proposed adjustments

August - September 2003 (less than a month): Short-term Specialist Mission-3

1. Review results of WUA programme
2. Advice on continuation and follow-up