Department of Agriculture
UPLAND DEVELOPMENT PROGRAMME in Southern Mindanao
ALA/97/68

COMMUNITY INFRASTRUCTURE PROJECT DEVELOPMENT MANUAL

Prepared by:

Agriculture Support Infrastructures Component (AIS)

Technical Operations Group (TOG)

September 2000 Final Daft
November 2001 Revision

Table of Contents

ANNEXES

A. Project Approval Process Flow Chart

B. PMED-AIS Project Proposal Preparation, Monitoring & Evaluation Guidelines and the Project Review Committee

C. Sample of Project Implementation Agreement

D. Sample of POW with Cost Sharing Arrangement

E. Sample of S Curve

F. Design Procedures
   a. Rural Access
   b. Village Water Supply & Pipe Design Graph

G. Simplified FS Forms

H. FAD Fund Releases and Monitoring to LGU

I. DPWH Department Order No. 30 S. 1991 Preparation of Agency Estimates, No. 56 S. 1995 Quality of Plans, Memo from the DPWH Bureau of Design dated 23 July 1997 Checklist of requirements for review of plans and variation order

J. List of UDP covered Sitios, Barangay, Municipality and Province

Agriculture Infrastructure Support Project Development Manual

General Eligibility Criteria and Guidelines

To encourage community involvement in the project implementation of programme infrastructure component, the Upland Development Program will not implement infrastructure projects nor will it be involved in the identification, planning and design. Instead, the program will accept community-initiated and LGU-assisted infrastructure project proposals for review and approval for funding.

I. Eligible Projects

1. Grant Assisted Infrastructure with LGU and community contribution

- Rural access (Farm to Market Roads and Foot Trails) within the covered barangay
  - Spot improvement of barangay roads
  - Rehabilitation and construction of side drains, cross drains, short overflow bridges and box-culverts
  - Rehabilitation and construction of foot trails and foot bridges with a maximum span of 12 meters
  - Rehabilitation and construction of cable suspended foot bridges

Trees shall be planted along the sides of the road/trail improved or constructed (3 meters from the shoulder left and right or whenever possible), bridge approaches including the construction of soil conservation structures as required; This activity shall form part of the project.

- Potable Water Supply
  - Rehabilitation and construction of shallow and deep wells
  - Improvement, repair, expansion and new construction of gravity driven community water supply facilities

This shall include planting of trees around the spring eye with a minimum radius of 100 meters and along pipelines, and construction of soil conservation structures as required; This activity shall form part of the project.

- Agri-Water Supply (Irrigation)
  - Construction of gravity driven piped irrigation system with stream or spring source for orchard or vegetable farm
  - Installation of gravity piped irrigation system on existing Small Water Impounding Projects

This shall include the planting of trees along the stream banks, around springs eye with a minimum radius of 100 meters and around Small Water Impounding Dams; This activity shall form part of the project.

- Soil Erosion Control Measures to rehabilitate the watershed
  - Slope and gully protection along the sides of farm to market roads and trails/establishment of vegetation that deter soil erosion and construction of soil erosion control structures for slope and gullies
  - Reforestation of critical watershed areas
  - Construction of stream regulation structures
  - Improvement of existing soil erosion control structures and established erosion control vegetation in critical areas (dikes, gabions, ripraps and check dams)
  - Planting of permanent trees along road/trail sides and critical section of gullies

2. Credit-Assisted Infrastructure

- Primary and Secondary Crop Processing Facilities, like Community Post Harvest Facilities, Farm Product or Livestock Auction House, Mini-Market, Warehouse and agri-support infrastructures needed by the other program components. (Proposed Policies on UDP Grant and Credit Assistance to Upland Communities)

II. Project Selection Criteria

1) Rural Access

- Road will link the sitio's to barangay and market, and the spot improvement will make the road passable all year round.
- The beneficiaries must be communities of not less than 20 households located within the identified watershed.
- The community must be cohesive and willing to provide a share in the cost of the project either in services, cash or other resource The community is committed to operate and maintain the project upon completion.
- Trails must improve access of beneficiaries in the sitios to the barangay or all weather road must lead to the market
- Foot bridge must shorten the travel time of community resident from the production areas to market and provide safe river crossing for the school children.
- Willingness of the Barangay Chairmen/Council to support the project and endorsing it to the Municipal Government for inclusion in the Municipal Annual Investment Plan, to ensure annual repair and maintenance budget allocation.
- Project must have no right of way problem or conflict
- The identified road project must be included in the Barangay and Municipal Annual Investment Plan to ensure the allocation of LGU repair and maintenance budget

2) Water Supply

- Community has no access to safe potable water and there is a safe source of water to supply the communities need.
- Existing water supply inadequate and can be upgraded (12 HH/faucet).

- Community must be cohesive, willing to provide a share in the total project cost either in services, resources or finance.
- Community committed and capable to operate and maintain the project upon completion.
- Project is supported by the LGU, Barangay, Municipal and Province)
- Location/site of infrastructure must in public land and no right of way problem or conflict.
- The identified water supply project must be included in the Barangay and Municipal Annual Investment Plan to ensure the allocation of repair and maintenance budget

3) **Agri-Water Supply (Irrigation)**

- Farmers into high value crop farming and farms clustered or with common boundary.
- Farmer group must be cohesive and with appropriate land tenure instruments or prospect for land tenure.
- Availability of adequate water source and the distance from source to the service area is not more than 3.0 kilometers
- Project is supported by the LGU, Municipal Agriculture Officer and Provincial Agriculture Office.
- Location of structures must be on public land with no right of way problem or conflict.
- Community committed and capable to operate and maintain the completed project.

4) **Soil Erosion Control Measures**

- Erosion damaged slope and gullies identified by farmers during sitio planning or community consultation
- Critical areas along roads, trails, rivers, and springs developed for village water supply facilities identified by the community

Project Screening

This stage determines the capability and willingness of the community, barangay, municipal government to implement the project. The Municipal Project Office together with the PPO Municipal Support Officer and Post Harvest Engineer is responsible for the conduct of evaluation at this stage

a. Responsible person will interview the P/M/LGU/Barangay officials to confirm whether they are aware of the responsibility that they face with the project
b. The team must be able to gauge the strength of the association/community and sustainability of the group cohesion as well as the degree of willingness in the cost sharing, either in service resources or finance in the project.
c. LGU/Municipality-Barangay support for the project implementation as well as project inclusion in the Local Government Investment Plan of the Municipality
d. Ensure that the project is eligible for funding based on the selection criteria.

Cost Sharing Arrangement

Budget allocation for the component program wide is presented in the table below;

Type of Infrastructure	Total EC Grant Fund	Percentage from Total Budget
Rural Roads/Bridges	Php 34,200,000.00	43%
Water Supply	Php 15,661,000.00	20%
Agri-water Supply (Irrigation)	Php 3,960,000.00	5%
Trails/footbridges	Php 14,784,000.00	19%
Erosion prevention measures	Php 11,396,000.00	14%
Total	Php 80,001,000.00	100%

This community infrastructure project budget allocation shall cover the prioritized communities in the 120 selected Barangays located in 30 Municipalities in the 5 provinces covered by the UDP. (refer to Annex J, List of sitios, Baragnays, Municipalites and Provinces cpvered by the UDP.

As a guide in determining the cost shares of the Programme, PLGU, MLGU, Barangay and the Community in a infrastructure project package, refer to table below. the computation is based on the parameters established in the UDP Financial Agreement. Where LGU contributions is not limited to cash, but services or materials magnetized included.

Type of Infrastructure	**EC Contribution**	**LGU Contribution**	**BGY/CMMTY Contribution**
Rural Roads /Bridges /Footbridges	**45%**	**25%**	**30%**
Water Supply	**45%**	**15%**	**40%**
Agri-Water	**45%**	**15%**	**40%**
Trails	**20%**	***/10%**	**80%/70%**
Erosion prevention	**40%**	**40%**	**20%**
Total Grant Fund	**37.50%**	**22.5%**	**40%**

*Barangay can avail the use of heavy equipment owned by the Provincial/Municipal Government provided they supply the fuel and oil

However, as a matter of policy, the programme would retain flexibility to respond to the infrastructure needs of the 480 communities in 120 baramgays located in 30 municipalities in the 5 provinces of Region XI covered by the UDP.

Project Proposal Stage

This stage determines the socio-economic and technical viability of the project proposed by the community, through their written petition and endorsement of the project by the Barangay Council/BDC to the Municipal Government for inclusion to the Municipal Investment Plan.

The project proposal will be prepared by the community with the assistance from the Municipal Project Team; the conduct of survey and the preparation of plans, design, program of works and maintenance and repair scheme through the assistance of the MPT Engineer and Municipal Engineer.

Annex H, FAD Fund releases to LGU's and Monitoring, Item No. 2, Proposal Procedure, Annex 2 PMED/AIS Guidelines for Proposal Preparation.

The proposal shall cover the following:

- Location of the project site
  - Project in relation to other infrastructure in the area and its contribution to the UDP objectives.
  - Information on influence area/service area end expected benefit social economic and environmental.
  - Engineering plans, cost estimate and program of work with cost sharing arrangement.
  - Implementation arrangement, construction schedules and fund release schedule, Annex H
  - Repair and maintenance scheme/arrangement with LGU-Municipality-Barangay-Sitio with cost budget presented.
  - Project monitoring and evaluation. (Refer to Annex 2 Proposal Form)

- Attachments:
  - Site location map, showing the community and the project site and other reference point (drawn not to scale).
  - Site deed of donation for private land accepted by the Barangay chairman as authorized through a barangay council resolution in case the site is privately owned.
  - Certification/resolution from the barangay council that the site was designated for the use of the project in case the site is owned by the barangay.
  - Community request/petition for the project.
  - Certification from the LGU that the projects is not a completion of unfinished project previously funded by a foreign, national or local funding agency.
  - Right of way (certification of no conflict by the barangay captain/council).
  - Community resolution on commitment to operate and maintain the completed project

III. Project Appraisal and approval

The Municipal Project Office together with the PPO Post Harvest Engineer shall appraise the project and site prior to submitting the project proposal to the PROJECT REVIEW COMMITTEE (PRC) for review and approval. Annex 2. Appraisal visit to the project would take a maximum of 3 days or depending on the distance from the all weather road or weather and an appraisal report will be prepared after the visit and validated information attached to the project proposal.

The intention of the appraisal visit is to tie up loose ends by clarifying issues and finding options for their resolutions. The end product of the visit should be a solid project concept and plan of implementation where the risk is reduced to the barest minimum. The appraisal report will form part of the inputs in the approval of the proposals by the PMO-PRC. Annex A, Project Approval Process Flow Chart.

Procedure:

- Discuss with the proponent the findings of the appraisal and clarify issues concerning the project proposal.
- Advice proponent on the activities to be done to enhance the acceptability of the project proposals for approval.
- A review of project proposals for adherence to the parameters set in Annex 2 is the last stage of evaluation that a project will go through before it is endorsed to management project review committee (PRC) for review and for approval.
- All data should have been verified, social analysis conducted and all the required documents in order.

VIII. Detailed Engineering

Detailed Engineering Plans, Estimates and Program of Work Preparation

1. Detailed engineering investigations, and designs for the project repair, rehabilitation and construction shall sufficiently be carried out in accordance with the DPWH standards and specifications by the LGU-Municipality.

2. Detailed engineering shall proceed only on the basis of the preliminary engineering study made which establishes the socio-economic and technical viability of the project and in conformance to UDP policy and standards.

3. A schedule of the detailed engineering activities shall include the following:

   a. Project site investigation
   b. Preparation of design for improvement, rehabilitation and or construction of the project.
   c. Preparation of specifications based on DPWH standard
   d. Preparation of quantity and cost estimates
   e. Preparation of program of work

f. Preparation of proposed construction schedule, based on the community planting calendar

4. Works under detailed engineering shall include the following:

a. Design, standard – DPWH based LGU engineering practice shall be adopted

b. Detailed engineering technical plans shall be prepared in accordance with the DPWH standard on plans preparation and shall include the following:

- Site location and development plan
- Plans for construction and or plan of existing project indicating the sections to be repaired
- Typical sections and details of infrastructure section for repair or rehabilitation
- Profile and plans of roads, water system and piped irrigation for construction

c. The LGU concerned particularly the municipal engineer or his staff shall assist the community in the preparation of the technical plans in accordance with the existing LGU- DPWH standard symbols, plan size, title block and authorized signatories.

d. Quantities – all construction quantities shall be computed to a reasonable accuracy of plus of minus five percent (5%) to avoid variation orders, using the metric units.

e. Program of works – shall be prepared and submitted for approval with a detailed plans and estimate to include the cost for the provision of appropriate repair and maintenance tools on all type of project. Refer to Annex K, Sample of budget details for roads, water supply (domestic/agricultural use), foot trails and footbridges

f. Training of organized community infrastructure group/beneficiaries in the program covered watershed areas on community project identification, planning, design, construction /rehabilitation, sustainable operation, repair, maintenance and monitoring & evaluation shall be provided with LGU contribution. The training activity and cost shouldered by the Programme, shall be included in the community project implementation program of work and budget.

g. Construction schedule – must be prepared and submitted together with the program of work for approval.

5. Check list of technical/engineering documents for project evaluation and approval:

a. Site development plan
b. Plan, detailed sections and elevations
c. Program of work showing and identifying the source and amount of equity component.
d. Derivation of items/unit cost
e. Gantt chart (S-Curve) based on farmers planting calendar.

6. Indirect cost factors for Detailed Engineering preparation supervision.

Item	Indirect Cost Factor
1. Pre-engineering cost (LGU Equity)	3% of Direct Cost
2. Engineering Supervision (LGU Equity)	5% of Direct Cost
Total	8% of Direct Cost

IX. Project Financing Arrangement

1. Financial Arrangement

Program will provide part of the of the project cost (materials, fuel and oil), the LGU/Municipality may put up the required local counterpart fund in cash or in kind.

Budget allocation for the component program wide is presented in the table below;

Type of Infrastructure	Total EC Grant Fund	Percentage from Total Budget
Rural Roads/Bridges	Php 34,200,000.00	43%
Water Supply	Php 15,661,000.00	20%
Agri-water Supply (Irrigation)	Php 3,960,000.00	5%
Trails/footbridges	Php 14,784,000.00	19%
Erosion prevention measures	Php 11,396,000.00	14%
Total	Php 80,001,000.00	100%

This community infrastructure project budget allocation shall cover the prioritized communities in the 120 selected Barangays located in 30 Municipalities in the 5 provinces covered by the UDP. (refer to Annex J, List of sitios, Baragnays, Municipalites and Provinces cpvered by the UDP.

The Local Government Unit (Province/Municipal) shall open a separate bank Trust Account as depository for funds coming from the UDP. The LGU will deposit their equity contribution to the above trust account. (refer to Annex H fund releases and monitoring to LGU's)

It is recommended that project be implemented by Administration for efficient fund utilization and ensure realization of LGU-Community contribution.

2. Condition for Fund Release

Upon approval of the Project Documents (detailed engineering plans, specifications, and program of works), the UDP-PMO shall inform the LGU through the Provincial Project Offices to submit the documents required for the initial release of funds to wit:

- LGU-Municipality shall request for fund release through TAMA with Provincial Project Managers endorsement and a copy of Co-Director approved Project Document attached.
- Certification from the provincial/municipal treasurer on the availability of funds for the specified amount of equity contribution and routine maintenance.
- For a detailed UDP fund release and monitoring procedure refer to (Annex H, Fund Releases and Monitoring).

X. Project Implementation and Monitoring

1. General Specifications

The execution of civil works for repair, rehabilitation, construction of the project, shall be guided by the appropriate DPWH Standard Specifications for Roads and Bridges, Water Systems and NIA Standard Specifications piped irrigation.

a. All works performed and materials furnished shall be in conformity with the approved plans and specifications and in accordance with sound engineering practices

b. Plans, dimensions and specifications shall be considered a target values. It is the intent of the specifications for materials and workmanship to be uniform in character and shall conform to the prescribed target values.

c. In the event that the PPO Post Harvest Engineer finds the materials or workmanship not in conformity with the plans and specifications and have resulted in an unsatisfactory or inferior results, such defective materials shall be removed and inferior workmanship re-do or otherwise prescribed.

d. All construction work shall be executed in accordance with the approved plans and program of work. The Project Engineer shall endeavor to provide the PMO through the PPO Post Harvest Engineer with details of any necessary major changes in the scope of work, methods of implementation and other revisions in the original plan and obtain its confirmation before proceeding further with the work.

e. Revision of plans, design and other change in the repair, rehabilitation or construction works shall have strong technical and economic justifications. In no case shall the increase of total project cost reach 5% and such change shall thoroughly be studied.

f. Project implementation shall start with the Municipal Project Office-LGU conducting a pre-construction conference with the community, attended by

the Municipal Support Officer, PPO Post Harvest Engineer and Municipal Engineer as the case may be. This activity shall include the organizing and training of a Barangay Monitoring Group to monitor the project implementation to include the validation of UDP/LGU/BRGY/Community committments.

2. Implementation Structure

2.a Engineering Unit (UDP-PMO-PPO), Under the Technical Operations Group of the PMO, the Deputy Director is assisted by the Agri-Infrastructure Support Coordinator with the PPO Post Harvest Engineers as support engineers assigned in the UDP covered provinces. Their function shall be:

- Agri-Infrastructure Support Coordinator

1. Conduct a thorough evaluation of LGUs to determine their technical, administrative and financial capability to implement infrastructure activities

2. Operational supervision of all PPO Post Harvest Engineers and coordinate with LGU technical staff.

3. Establish a mechanism and procedure for approving variation orders/change orders and price escalation request from contractors in case the project is contracted.

4. Conduct inspection, supervision on all projects and identify problem areas and provide solutions and alternatives on their respective area of responsibility.

5. Review, analyze and evaluates periodic or monthly reports of project implementation and recommend solutions to problem encountered

6. The PMO, shall conduct periodic supervision, inspections and monitoring. From this activity the PMO, shall issue site instructions to the Project Engineer through the PPO Post Harvest Engineer, relative to problems identified in the field and its corresponding measures to be made.

- Post Harvest Engineers

1. Provide technical assistance to the community/MPT Engineer in identifying and preparation of projects for rural infrastructure projects such as rural access, water supply system, hanging foot bridges and overflows/crossings.

2. Check, review, and evaluate; engineering plans, designs, drawings, construction schedule (bar chart, gantt chart, pert/cpm), S-curve, detailed estimate and program of work submitted by the LGU before recommending it for approval by the PMO, otherwise

return all documents to the LGU for modifications, corrections and revision as the case may be

3. Always attend relevant community project consultations conducted by the LGU as observer.

4. Prior to any construction works; attend the pre-construction conferences with the community conducted by the LGU-Municipal Engineer. This activity shall include the planning for community monitoring, maintenance and repair training on completed project maintenance.

5. Conduct site validation for projects identified by the community within the watershed area. This work include the assessment of LGUs acceptability of project requirements.

6. Review and submit all monthly physical accomplishment submitted by the LGUs to the PMO.

7. Participate in final inspection of all project implemented by the LGU. and during the conduct of community project operation and maintenance trainings and completed water system or irrigation projects test run by the LGUs.

2.b Municipal Project Team

The Municipal Project Team staff is composed of Local Government Unit personnels designated by the Municipal Mayor. The MPT shall be responsible for project implementation. For smooth execution of the project the Municipal Mayor, shall designate the Municipal Project Team Engineer, in supervising the project implementation. As such he can designate a competent Project Engineer, which shall oversee the day to day project operation.

The LGU shall be responsible for the permits and clearances for building construction, water rights, laboratory analysis for potable water, environment, quarry for construction materials and right of way negotiations to include all the related labor cost and processing fees and this shall form part of their share of the project cost.

During work operation the Project Engineer in coordination with the community leader and staff shall see to it that all materials, labor, and equipment use during the days operations is reflected in the daily report of the project and at the project logbook. Likewise, weather chart, plans or detailed sections shall be charted and updated in order to have an accurate description of the project status.

Collate all community project progress reports prepared by the MPT Engineer and submit to PMO through the Post Harvest Engineer.

- MPT Engineer/Project Engineer:

  1. Conduct a pre-construction meeting with community beneficiaries to discuss the construction schedule, responsibility of the community and project supervision/management with the Post Harvest Engineer.

  2. Undertake and or supervise the project.

  3. Directly be responsible for the timely completion of the project.

  4. Ensure that the project implementation is in accordance to the approved plans and specifications.

  5. Prepare daily reports, logbooks, physical accomplishment reports, statement of works accomplished and other related works and submit it to the MPTL.

  6. Received and implement site instructions.

  7. Prepare monthly weather report.

  8. To be present daily at the project site during the entire project implementation until it is completed or he can delegate the foreman in his absence.

3 Implementation Mode

Implementation of projects is recommended to be carried out by LGU-Direct Administration to eliminate the time duration required in processing the bidding and awarding of contract and for the project to be cost effective. The Barangay Council infrastructure committee of benefiting community shall be required by the MLGU to participate actively in the project implementation monitoring, and to ensure a uniform employment opportunity among the beneficiaries as in the hiring of unskilled and semi-skilled construction workers.

4 Monitoring and Reporting System

A monitoring and reporting system shall be installed and performed for the on-going project works, to include reports on accomplishments and work progress, materials quality control test and results and other construction data and information

a. Monthly progress report
   A monthly Progress report shall be prepared and submitted by MPT to the PMO through the PPO Post Harvest Engineer copy furnished PPO Manager

b. Completion Report
A completion report shall be prepared by the MPT and submitted to the PMO through the PPO Post Harvest Engineer copy furnished and noted by PPO Manager. Preparation of completion report shall include pictorials taken before, during and after construction. A certification from the community assisted by the PPO Post Harvest Engineer that the project was completed in accordance to plans, specifications, program of work and sound engineering practices. Any deviation from the plan during construction shall be reflected on the original plan or and as built plan.

XI. Liability period

a. The works on the repair, rehabilitation or construction shall be considered completed when a final inspection has been made and found to be satisfactorily completed and in accordance to the approved plans and specifications and the project completion certificate has been signed by the persons concerned.

b. Final acceptability shall be determined from the following:

- That all defects found during inspections as recorded on the field inspection reports have been remedied or corrected.
- All required documents and plans prepared and submitted to the PMO through the PPO.
- Pictorials taken before, during and after construction or specific segments of civil works.

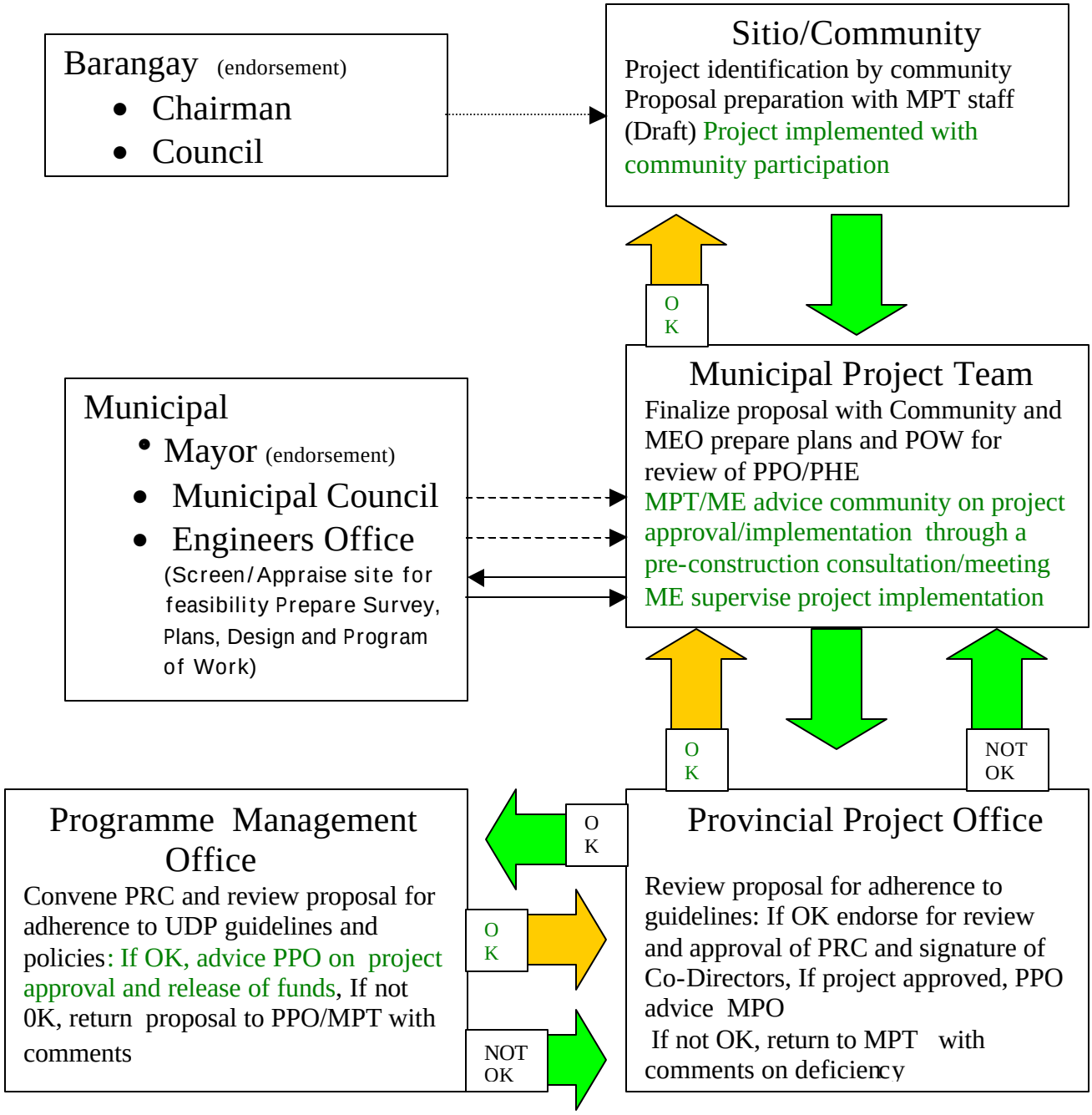
c. Final Acceptance and Turn Over – When the project has been certified as finally completed by the PMO, then this project shall be turned over to the community/LGUfor operation and maintenance.

XII. Operation and Maintenance

Completed project operation and maintenance shall be the responsibility of the LGU and Community/Beneficiary. Programme infrastructure projects shall be included in the LGU/Municipal Annual Investment Plan for inclusion in the list of projects under the proceeding annual repair and maintenance budget allocation. The limited maintenance budget of the LGU may be augmented through innovative measures such as collection of tolls fee from road users, or collection of operation and maintenance contribution from the members of the Barangay Water Users Association. With the initiative of the UDP, the DPWH-District Engineer, PLGU-Provincial Engineer, and MLGU-Municipal Engineer in consultation with the Barangay/Community shall come up with a ROAD USER POLICY a guide for all road user on the sustainable use of roads with the legislative support of all concerned LGU and Govern

ANNEX A

PROJECT APPROVAL PROCESS FLOW CHART



Note: Green – denotes the flow of project idea and project proposal
Gold – flow of approved project proposal

ROAD DESIGN

1.0 General

1.1 This design guidelines will deal primarily with earth (where the natural ground is laterite, e.g. a mixture of gravel and sand in a clay matrix) or gravel roads where the two-way traffic volume is 0-50 vehicles per day. These correspond to Class D roads as classified by the Department of Interior and Local Government.

1.2 In areas where the natural ground is not suitable for road construction i.e.
clays that are mot firm enough, silty or sandy surfaces, a stabilising 200 mm or more layer of gravel or lime stone material may be used.

1.3 Very soft ground surfaces, such as waterlogged ground that cannot be drained should be avoided if possible. If they can not be avoided it is likely that, unless a great deal of money is spent on the road and if not done properly problems will reoccur. One suggested cheap form of construction which may be tried is to lay bunches of bamboo or small logs on the existing ground followed by a layer of gravel mix, with a maximum aggregate size of 150 mm to level the corrugation caused by the roundness of bamboo bunches or logs, to form a sub-base and topped with a 300mm layer for graded gravel. Bamboo or logs provide buoyancy and prevent the stones and gravel of being pushed into the water logged ground.

1.4 As far as possible road projects should maintain the existing alignment (horizontal and vertical) of the road. Any realignment of the existing road should be made only if the cost incurred is minimal.

1.5 The following sections contain suggestions for practical design practices which should be followed whenever possible, i.e. without greatly increasing the cost of construction.

Table 1 Design Standards

Design Component	Rehabilitation	New Construction
Width - straight (m)		
- sharp curve (m)		
Passing Bays	/km	/km
Surfacing (compacted)	0.20 m	0.20 m
Min radius of curve (m)	20 m	20 m
Preferred max gradient (%)	12 %	10 %

Absolute max gradient (%)	15 %	15 %
Stopping sight distance (m)	30 m	30 m
Right of way (m)		
Design loading of bridges	HS 15-44	HS 15-44

2.0 Design of Horizontal Alignment

2.1 The alignment should be plotted to a scale of 1:1000

2.2 The information and data to be provided on the plan should include

a. Route survey data plotted on the plan including the drainage facilities (new construction)
b. Existing road (edge of running carriageways)
c. Existing drainage and waterways (showing directions of flow)
d. Steep slopes
e. Rock outcrops
f. Swampy or waterlogged areas
g. Edges of cultivated fields
h. Walls and fences
i. Houses and other structures

2.3 Avoid cut and fill on either side of the road where the compaction of the embankment is difficult.

2.4 Avoid areas of known unstable ground

2.5 Circular curves should be adopted without the need for spirals or transition curves

2.6 Sharp curves at the end of long tangents are to be avoided. Large radius bends should be provided to improve forward visibility whenever possible.

2.7 Long straights or new alignment should be avoided. They encourage excessive speeds and dust nuisance. New alignment adds construction cost.

2.8 The line of the toe of embankments or cut sections should be shown in the plan, in order to:

a. Determine the correct location of pipe and box culverts.
b. Facilitate measurement of ancillary works such as stone masonry, grouted riprap, slope protection and other rural road components.
c. Check the need for additional right of way.
d. Determine the effect on existing structures.

3.0 Design of Vertical Alignment

3.1 Scale of the longitudinal (horizontal) profile shall be 1: 1000 and vertical
1:100 And vertical scale of 1: 200 may be used for rough or hill terrain.

3.2 The existing ground line, final grade line, horizontal alignment and widening should be shown on the profile.

3.3 In designing the vertical alignment, the grade shall be made as such that
whenever possible the existing road surface can be utilized.

3.4 In area subject to inundation during rainy season the finished grade line
shall be at least 0.50 m above the maximum flood level.

3.5 A minimum grade of 0.5% in through cut areas shall be provided to facilitate longitudinal drainage and less than 0.5% grade may be allowed on embankment.

3.6 Vertical curves shall be designed to provide at least a minimum safe stopping distance of 30 m.

3.7 When algebraic difference of grades is less than 1.5% no vertical curve
element is required.

3.8 The vertical alignment is determined by first considering the cross-section,
in order to:

a. Minimize earthworks and rock cuts.
b. Establish stability of cut and fill slopes.
c. Raise the pavement above the maximum flood level

3.9 The minimum depth of fill between the finished grade and the top of concrete pipe culvert is 0.60 m.

3.10 The lowest point of vertical sag curve should be located on embankment section and not on the cut section to minimize earthworks.

4.0 Design of Cross-Section

4.1 Sections should be plotted to a scale of 1:100

4.2 Distance between section shall be 20 m, and additional roadway cross-section shall be made if the topography requires.

4.3 The following information shall be included on the cross-section:

a. Sub-grade line, slope and ditch
b. Finished grade elevation and normal crossfall superelevation in conformance with the typical road way sections.
c. Detailed description of existing structures.
d. Type of excavated materials.

4.4 Suitable angles for cut slopes should, whenever possible, be determined from existing adjacent stable slopes in similar types of soil. The following are given as a guide only.

Table 2 Cut Slopes

Classification of Soil	Recommended Slope in Cut
	Horizontal : Vertical
Hard and sound rock	¼ : 1
Soft rock	½ : 1
Cohesive soil	1 : 1
Sand Soil	3 : 1
Sand	4 : 1

Plasticity test, trial pits and observations of existing exposed cut faces should be used to determine soil type

4.4 The recommended slopes of embankments are summarized as follows:

Table 3 Embankment Slopes

Height of Embankment	Recommended Embankment Slope
Up to 1.0 m	2 : 1
1.0 m to 2.0 m	3 : 1
more than 2.0 m	4 : 1

Note: Above data is for cohesive soil

4.5 The normal cross fall adapted should be 4.0% for gravel roads and 5% for earth roads.

4.6 Road formation in areas of slide sloped section should be within the cut ground.

4.7 Curves of narrow roads should be widened in the inner side to avoid the rear wheel from passing the shoulder.

5.0 Design of Drainage

5.1 One of the most important aspects of the design of a road is the provision made for protecting the road from surface and ground water. If water is allowed to saturate the sub-base the base will also be affected. And if there is a pavement on top of the base the pavement will weaken and more susceptible to damage by traffic. The road must be constructed with sufficient camber or crossfall to shed rainwater quickly and the formation of the road must be raised above the level of the local water table to prevent it being affected by ground water. Erosion by water must be controlled as this can result in loss of surfacing, undercutting of embankment and collapse of road edge.

5.2 For reconstruction or improvement of existing roads, it is suggested that drainage requirements determined through observation of existing situation and discussion with local residents who can provide good information as to the problems of the area.

5.3 A good drainage system consists of the following components;

- Cut off drains or catch water drains - A longitudinal cut off at the top of a cutting to prevent water from flowing down the slope. This need to be well maintained to be effective.
- Road surface drainage – To prevent water from eroding or penetrating into the road surface and is accomplished by compacting the road surface properly according to the DPWH specifications and to make the road surface water resistant and shaping a crown with 4% to 5% camber so that water can flow into the side drains as quickly as possible.
- Side drains – the function of the side drain is to collect water from the road surface and cutting slopes. The run parallel on both side of the road and the longitudinal gradient is usually the same as the road (side ditch). They are usually trapezoidal in section and the bottom must be at least 250 mm below the top of the sub-grade of the road. In erodible soils of steep gradients it may be necessary to line the side drains with 150 mm thick masonry riprap to prevent scour or to provide scour checks.
- Pipe culverts – This is the most common type of culvert and consists of concrete pipe or reinforced concrete pipe/box placed under the road within an embankment to provide a suitable means of conveying streams or the contents of side drains under the road with no restrictions of traffic. The pipe must not be less than 600 mm in diameter to facilitate cleaning, it is advantageous to install culvert with a bigger diameter than the designed diameter.
- Fords - the simplest and cheapest river crossing. Large stones with flat tops can be placed across the road in the stream bed to provide a firm footing for vehicle. Such ford will require repair after flooding, and the repair is cheap and may be done by the community. A concrete ford can be constructed in lieu of the stone materials ford and this does not need repair after floods. This provides a better running surface for traffic and should be resistant to erosion. After flooding it will probably be necessary to remove debris from the surface before vehicles can use the crossing and road gradient should not be more than 10% on either side of the ford.

6.0 Road Maintenance

a. Maintenance works are divided into two (2) categories namely 1) routine maintenance (annual) and 2) periodic maintenance. Major routine maintenance works are patching, resurfacing, reshaping, vegetation control, clean and repair culverts and minor repair of bridges. While

major periodic maintenance works items are considered as re-gravelling for gravel roads in every ten (10) years and PCC overlay for concrete paved roads in every 25 years.

DOMESTIC WATER SUPPLY

1.0 Introduction

1.1 This section gives the step by step guidelines for the design of a simple village water supply system from a spring source. These same basic steps are required for both feasibility stage design and detailed design. As a guide for the design of a village water system these contain a reasonable degree of flexibility and the user of this guide is suggested to use his own judgment.

2.0 Design Assumptions

2.1 The following assumptions are used throughout the design process:

a. Design life of 10 years
b. Population growth rate 7% per year
c. 6 individual per household
d. Schools and hospitals have population or household equivalent
e. 60 liters water requirement per day per individual
f. Water distribution by communal faucet
g. Maximum number of household per faucet is 10

2.2 Designed water usage:

a. Drinking
b. Cooking
c. Bathing and washing clothes

3.0 Design Steps

3.1 The following steps should be followed in order to prepare a satisfactory design presentation.

Step 1 : Water quality and quantity
Step 2 : Water requirement
Step 3 : Site survey
Step 4 ; Preliminary layout
Step 5 : Pipe sizes and types

Step 6 : Reservoir requirement
Step 7 : Structure types, details and locations
Step 8 : Fitting and details
Step 9 : Costs

3.2 Step 1 – Check water source for;

a. Water Quality – all sources of water must be tested for quality before any development is undertaken. Good quality water for household purposes should be :

- Clear, colorless, odorless and palatable
- Contain naturally dissolved chemicals within prescribed limits
- Bacteriologically safe

b. Sampling and testing of water should be carried out by the Department of Health. The use of sterile containers and correct sampling techniques are essential if reliable results are to be obtained. It is recommended that one sample should be analysed at the project identification stage and at least a further 2 before proceeding with the final design. The samples should be collected at different times of the year i.e. one during the dry season, one following rain and one at an intermediate time of the year.

c. Water sample must pass the laboratory standard for drinking water of the Department of Health. However there might be water samples that does not pass the DOH laboratory standard but taken from a source that is being use by the community for a long time with community incurring no health problems.

d. Water Quantity - Flow of water should be adequate to supply the community needs throughout the year. Hence the discharges from the springs should be measured a number of times including the driest months of the year. The discharged may be determined by one of the following methods;

- Timing how long it takes to fill a container of known volume (for small flows)

  Flow Q l/s = Volume of container in liters/time to fill in seconds

- Constructing a v notch (on plywood) overflow weir and measuring the depth of flow over the weir.

Q = 0.31 tan A/2 /(2g) H 5/6
A = angle of notch G = gravity 9.81 m/s/s
Note: The units for this equation are H in m, Q in m/s

- Recording the time it takes for a float to flow down say 20 meters of fairly regular stream section.

The distance divided by the time gives the velocity of the float. For a surface float which flows down the middle of the stream this velocity x 0.8 = mean velocity. The mean velocity x cross sectional area of the stream gives the
discharge.

e. It is important to talk to local people the springs flow history. Large
variation s in spring discharge/flow of location are a cause for further
investigation. And possible other adjacent source should be verified.

f. It is important to note that water quantities of less than 60 liters/ hour/
day do not necessarily make a source unusable. Each situation must be considered individually. For a community which obtains all its water need from a polluted river a good quality spring source that can supply 20 l/h/d for drinking and cooking could provide many of the benefits
of a source producing 60 l/h/d and would well worth developing.

3.3 Step 2 – Determine water requirement

a. Assess the total number of households to be supplied. In cases where schools are being served it is necessary to determine the number of pupils. Schools are then be treated as equivalent number of household for the purpose of sizing the transmission pipes as follows:

20 pupils shall be assumed to be equivalent to 1 household

Other buildings will require separate investigation but unless they contain people who have not been counted elsewhere or are responsible
for water demands which are none domestic in nature should be ignored.

b. Table below shows total daily demand for various numbers of

households which have been factored to allow for population expansion at 7% over 10 years.

Table 1

H/H	10	20	30	40	50	60	70	80	90	100
TDD cu.m/day	7.1	14.2	21.2	28.3	35.4	42.5	57.8	56.7	63.7	70.8

H/H – households TDD – total daily demand

The present number of households should be used in all design calculations.

3.4 Step 3 – Site Survey

a. The site survey will determine:

- Length of pipes required
- Level difference between the source and the point of delivery (reservoir and faucets).
- A longitudinal pipeline profile which can be used to determine the pressure in pipes at various locations.

b. Surveying instruments should be used for gathering final design data

. However for feasibility studies an altimeter, hand level, hand compass and tape can be used. Level at source and point of delivery, general ground profile and critical points, e.g. changes of direction should be determined in order to confirm that favorable gravity flow can be achieved.

3.5 Step 4 – Prepare preliminary layout.

a. On a plan, draw out the preliminary layout showing:

- Proposed source
- Pipeline route to reservoir
- Points of delivery
- Number of households, schools and other buildings in the vicinity
- Length of pipes

- Level differences between source, junctions and point of delivery.
- Each critical points should be labeled e.g. A,B,C, etc.

3.6 Step 5 – Determine pipe diameters and other construction materials

a. Pipe diameter – It is suggested that pipeline calculations be prepared in full for all water supply projects. The designer should consider factors such as the pressure in the pipeline at various points suitable locations for washouts and air valves, the degree of flexibility in the design in terms of available pipe capacity

b. Suggested criteria for pipe work hydraulic design:

- Recommended velocity range 0.50 – 1.0 m/s
- Min. velocity 0.30 m/s, max. velocity 1.5 m/s
- Residual pressure at faucet, low – 10 m, high 30 m, where it is difficult to locate a faucet appropriately without breaking these limits, must not exceed the min of 7.0 m and max 60.0 m residual pressure.

c. Pipe Type – there are three available pipes in the market:

1. Galvanized iron pipes (G.I.)
   - Available diameters (mm) : 13,19,25,32,38,50,75 and above.
   - Standard length = 6 meters

2. Plastic pipes
   - Available diameters (PE) mm : 13,19,25,32,38,50,63,75 and above
   - Standard lengths = up to 60 meter roll for PE pipe also depending on the size.

d. Selection of pipes (type) - Galvanize iron pipes are recommended for installation above the ground as they are less prone to physical damage.

-Polyethelene pipes can be joined

mechanically and simple, cost of pipe is
low, smooth internal surface, corrosion
resistant, light and easy to handle

3.7 Step 6 – Reservoir requirement

a. Reservoir should generally be designed to meet daily water requirements and can be filled up overnight. Sizing of reservoirs to provide a large volume storage. It is suggested that the minimum size of reservoir should be able to meet the daily peak demand and can be filled by the source overnight:

Example ; 40 household system
Spring source discharge 0.5 lps
Water use 20% daily demand 6:00 am – 8:00 am
40% daily demand 8:00 am – 4:00 pm
30% daily demand 4:00 pm – 6:00 pm
10% 0vernight

For 40 households the total daily demand is 28.3 cu. m. /day from Table l

Table 2 Calculation of theoretical daily demand (water)

Time Period	Supply 1	Demand 1	Difference l
6:00 am – 8:00 am	3,600	8,490	-4,890
8:00 am – 4:00 pm	14,400	11,320	+3,080
4:00 pm – 6:00 pm	3,600	8,490	-4,890
6:00 pm – 6:00 am	21,600	2,830	+18,770

(l : liters) Largest difficiency 6,700 liters Minimum of reservoir size = 7.0 cu. m.
Maximum size of reservoir = inflow overnight is 18,770 cu. m say 19.0 cu. m.

In practice the size of reservoir chosen will lie between these limits and will depend on factors such as :

- Factor of safety above minimum size to allow for variation in water use.
- Likely future expansion of system
- Size of site available for reservoir construction

Even if calculations indicate that reservoir is not required, it is considered a good practice to provide water storage for the following reasons:

- Allows to conduct periodic maintenance with out cutting off the water supply
- A reservoir near the village is a good place to conduct water quality check.
- The reservoir will act as a break pressure tank.

3.8 Step 7 – Determine structure type, details and location

a. There are a number of structures required for any rural water supply project and various standard types and details. The structures considered are as follows:

   - Spring boxes
   - Sedimentation tanks
   - Reservoirs
   - Break pressure tanks
   - Public faucets
   - Wash tubs

b. Spring box – springs should be allowed to discharge freely into spring boxes, i.e. the maximum water level in the spring box should be below the point of discharge of the spring.

c. Sedimentation tanks – For a good clear spring source a separate sedimentation tank is not required. However, if sampling and testing indicates that significant amount of solids can be removed by settling this indicate the need for a sedimentation tanks.

d. Reservoir - Most of the reservoir constructed or designed to date are reinforced concrete. However there are ferro-cement designs. If individual designs are required it should be remembered that in water retaining structures the amount of reinforcement is often not determined by the strength required to resist pressure but to minimize shrinkage cracking.

e. Break pressure tank – are only installed on sections of pipelines where a large changes in elevation and static pressures could lead to pipe bursts.

f. Tub and faucets – are the most frequently used component of a water system. No other structure will face more abuse, and no other structure will have to fit in so closely with local social and cultural needs. The water rights of the source and tub and faucet locations are the most likely parts of the system to cause arguments and disputes among beneficiaries.

3.9 Step 8 – Determine fitting details

a. The various types of fittings commonly used are described below:

- Isolation valve – these should be of the gate type. Valves are placed at various points in the main line and distribution network to permit isolation of areas for repair works.
- Flow control valve – globe type valves located at tapstands to control the flow of water and possibly in the main lines.
- Reducer and adaptors – used when there is a reduction of pipe size of a joint together pipes of different materials.
- Elbows – changes direction of flow (angles of 45 and 90 are available.
- Tee – devides flow into two for lateral connections.
- Cross – devides flow into three.
- Caps, plug and blind – are used at ends to stop the flow.

4.0 Step 9 Cost

a. A cost budget can be prepared based on the information on each step and the items considered are:

Materials
pipes
fittings
structures
miscellaneous
Labour
excavation
hauling
construction
Supervision
Community Counterpart

5.0 Operation and maintenance

a. Work items and cost for each O&M activity is estimated based on interview with the barangay councils and staff s of the rural water supply section of the DPWH. The O&M cost is divided into two categories, routine O&M (annual) cost and replacement cost. Major routine works are inspection of facilities, condition of water distribution, minor repair, collecting water charges and management. Replacement cost will be considered as every ten (10) years to replace some parts of the facilities. The O&M works will be carried out by the water users association.

FARM TO MARKET ROAD REHABILITATION IMPLEMENTATION GUIDELINES

Purpose

To ensure uniform, efficient, and effective implementation of Farm to Market Road rehabilitations within the UDP covered areas with funding from the DA, the following set of guidelines and procedures shall be followed and observed by all concerned agencies and stakeholders.

General Guidelines

1. Definitions

Farm to Market roads under this funding shall refer to as:

a. Farm to Market Roads – Provincial/Municipal or Barangay roads outside the municipal commercial/urban centers not declared as national road, including bridges, box culverts and drainage facilities that are part of the road section.

b. And the road is the main access to the market of farmers living within the UDP identified watershed areas or those roads which link the watershed areas to major market and trading roads to higher road class system.

2. Priority shall be given to the rehabilitation of existing roads or restoration of existing
roads to their original road class or to higher class. The technical design and specification for each of the project should conform with the DPWH design standard specifications for roads and bridges (Revised 1998).

3. Criteria for selection of Farm to Market Road for rehabilitation;

1. Road must be existing and needing rehabilitation to make it passable year round.
2. Road is not targeted for improvement within two years by other agencies or programs, i.e. MRDP, DIDP
3. Road will link the barangay covered by the UDP to the nearest market center
4. Priority will be Barangay road followed by Municipal/Provincial road.
5. Cost of rehabilitation should not be more than Php.1.0 M per kilometer
6. Beneficiaries must not be less than 200 households
7. Road will enhance agricultural productivity in the service area
8. Community must be cohesive and willing to provide equity either labor or other contributions
9. Community committed to maintain the project upon completion
10. Willingness of the barangay council and the municipal/provincial LGUs to support the rehabilitation of the project through the execution of Project Agreement with UDP.

4. The recommended type of road surface is gravel, surface course must be in accordance with the standard specification for roads and bridges of DPWH. And the works associated with the road rehabilitation are as follows:

- Cleaning and restoration of drainage canals and culverts
- Repair of embankments and preparation and compaction of sub-grade
- Adding a new 0.20 m thich layer of compacted selected base course for the 6.0 meters wide municipal road and 4.0 meters wide barangay road with passing bays as needed.
- Constructing additional culverts at an average of 0.40 lines of 36" diameter RCPC per kilometer as needed.

5. Project beneficiaries contributions/equity especially for labor requirements of the projects should be considered in estimating the project cost.

6. For the purpose of effectively implementing the project at the field level, a monitoring and action team shall be created and it shall be composed of staff from the a. Provincial or Municipal Agriculturist, b. Provincial or Municipal Engineer, c. Provincial or Municipal Planning and Development Office, DA-RFU XI and UDP-PMO/PPO representative.

Responsibility of the LGU:

1. The Municipal Project Team Engineer, Community representative (s) or authorized representative of the Barangay together with UDP PPO Engineer shall identify the farm to market rehabilitation project and submit a list to the UDP-PMO through the Municipal Project Team and Provincial Project Office for validation/evaluation. The evaluated list will be endorsed to the Office of the Agriculture Secretary for fund allocation.

2. The Municipal Project Team Engineer will conduct pre-engineering, survey, investigation, prepares detailed engineering and estimates, program of work and submit to the UDP-PPO for consolidation and review and forward to UDP-PMO/DA-RFU XI for approval

3. The Municipal/Provincial LGUs shall be responsible for securing and complying with the legal requirements related to the construction, such as road right of way, permits and legal fees or charges.

4. The Municipal/Provincial LGU shall implement the project thru the Municipal Project Team by administration or contracted out in accordance with the approved Program of Work, Plans, Specifications, Project Cost (Budget) and Construction Schedule.

5. The Municipal Mayor or Provincial Governor shall assign an Engineer to the Municipal Project Team to implement and supervise the project. The engineer shall be responsible for the preparation and submission of monthly progress report and completion report to the UDP-PMO through the MPT and PPO.

6. After the turn over of the project to the community, the LGU (Barangay/Municipal/Provincial) and the community shall be responsible for the continuous maintenance of the project.

Responsibilities of DA-RFU XI

1. The DA-RFU XI shall be the custodian of funds and responsible for the processing of payments

2. Conduct bidding and awarding of procurements and contracts

3. Submit progress report, submitted by UDP for the DA Secretary

4. Together with UDP-PMO, reviews and approves project design and estimates for funding

5. Conducts monitoring of project implementation.

Responsibility of the UDP

1. The PPO shall jointly identify together with the community and the Municipal Project Team Engineer the project and consolidate the list of projects submitted by the Municipal LGU and submit to the PMO;

2. Together with DA-RFU XI, the PMO review and approves rehabilitation plan, program of work and detailed cost estimates prepared and submitted by the Municipal LGUs for funding.

3. Facilitate Project Agreement (PA) between UDP, DA, LGU and Community/ Barangay.

4. The PMO/PPO shall conduct regular monitoring of project implementation to check compliance with the approved plans and specifications at least twice a month;

5. Consolidates monthly status reports and submit copy to the DA-RFU XI for submission to Secretary of Agriculture

6. Submits project completion reports;

7. Facilitates turn-over of completed projects to the Community and LGU concerned.