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PROJECT DESCRIPTION

Bagtingon Small Reservoir
Irrigation Project (BSRIP)

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Project Fact Sheet

Name of Project	Bagtingon Small Reservoir Irrigation Project (BSRIP)
Project Location	Barangay Bagtingon, Buenivista, Marinduque Province
Project Type	Small Reservoir Irrigation Project (SRIP)
Reservoir Area	16.90 hectares
Total Storage Capacity	1.13 Million Cubic Meters
Project Cost	Php 730,000,000.00
Project Proponent	National Irrigation Administration - MIMAROPA Bayanan II, Calapan City, Oriental Mindoro Mobile No: 09178495267; Landline: (043) 288-7267; Emailadd: mimaropa@nia.gov.ph Contact person: Engr. Gerardo R. Perez
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PROJECT DESCRIPTION

1.1. Project Location and Area

The proposed BSRIP is geographically located at the north-western part of Barangay Bagtingon between 13° 17' 49" in the North latitude and 121° 56' 36.02" in the East longitude. The project site is located within the Caigangan Watershed and it falls under the jurisdiction of the local government units of Gasan and Buenavista. It is bounded from the North by the Municipality of Gasan, to the Northeast by the Municipality of Boac, to the South by the Municipality of Torrijos, and to the Tablas Strait in the Southwest. The Irrigation Water Source (IWS), indicated by a solid blue line, has a total area of 765 hectares. The proposed dam axis is located within the Municipality of Bagtingon and is accessible by land vehicles, preferably four-wheeled automobiles from the nearest parking spot followed by trekking.

Meanwhile, the IWS encompasses five Barangays namely; Bayuti and Tambunan in the Municipality of Boac; Bagtingon and Malbog in the Municipality of Buenavista; and Tabionan in the Municipality of Gasan. The largest Barangay covering the IWS is Barangay Malbog with a total area of 313.99 hectares, while the Barangay with the smallest area coverage within IWS is Tambunan with only 3.26 hectares. Additionally, around 9.15% or 11.86 hectares of Barangay Bagtingon within the reservoir will be covered by the project.

Table 1. List of barangays covered by the project

Municipality	Area in Hectares				
	Barangay	Within NIA IWS		Reservoir	
		Inside the Protected Area	Outside the Protected Area	Inside the Protected Area	Outside the Protected Area
Boac	Bayuti	3.33	-	-	-
	Tambunan	3.26	-	-	-
Buenavista	Bagtingon	119.19	10.47	6.02	5.84
	Malbog	313.99	-	-	-
Gasan	Tabionan	312.93	0.03	5.01	0.03
Total		752.69	10.50	11.03	5.88

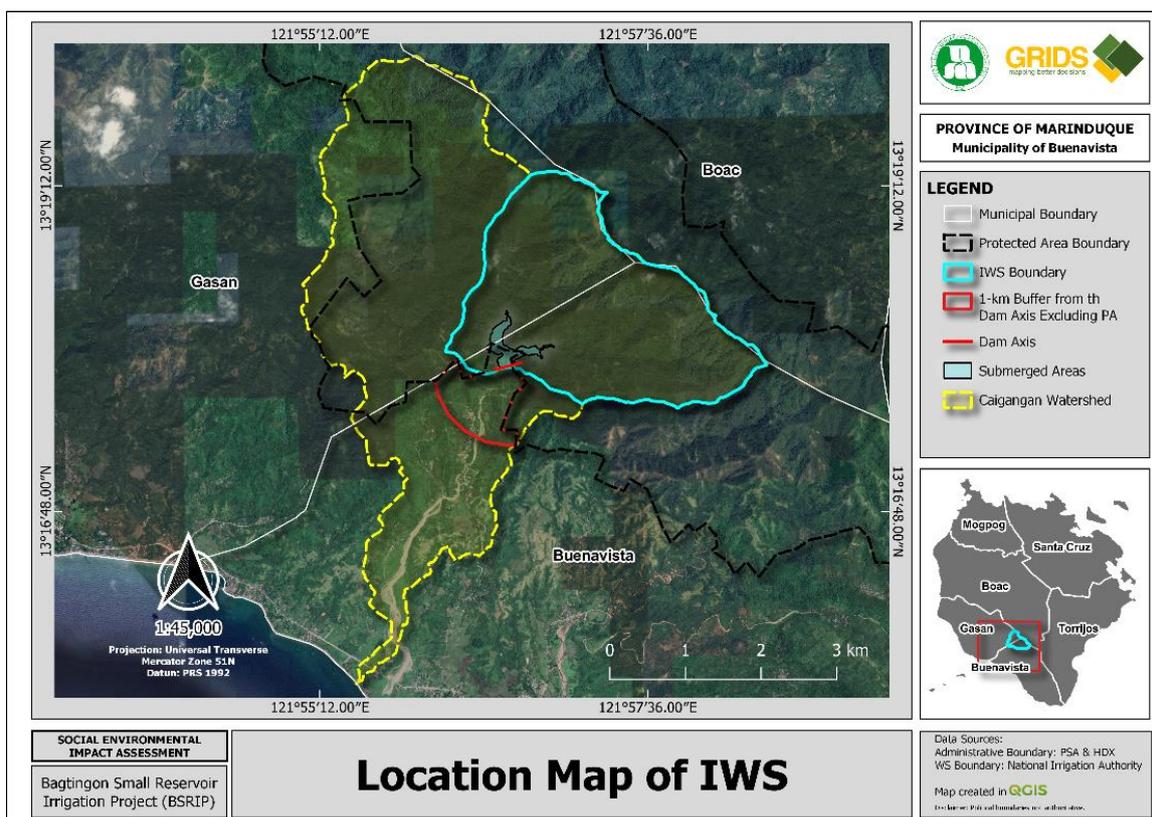


Figure 1. Project Location Map

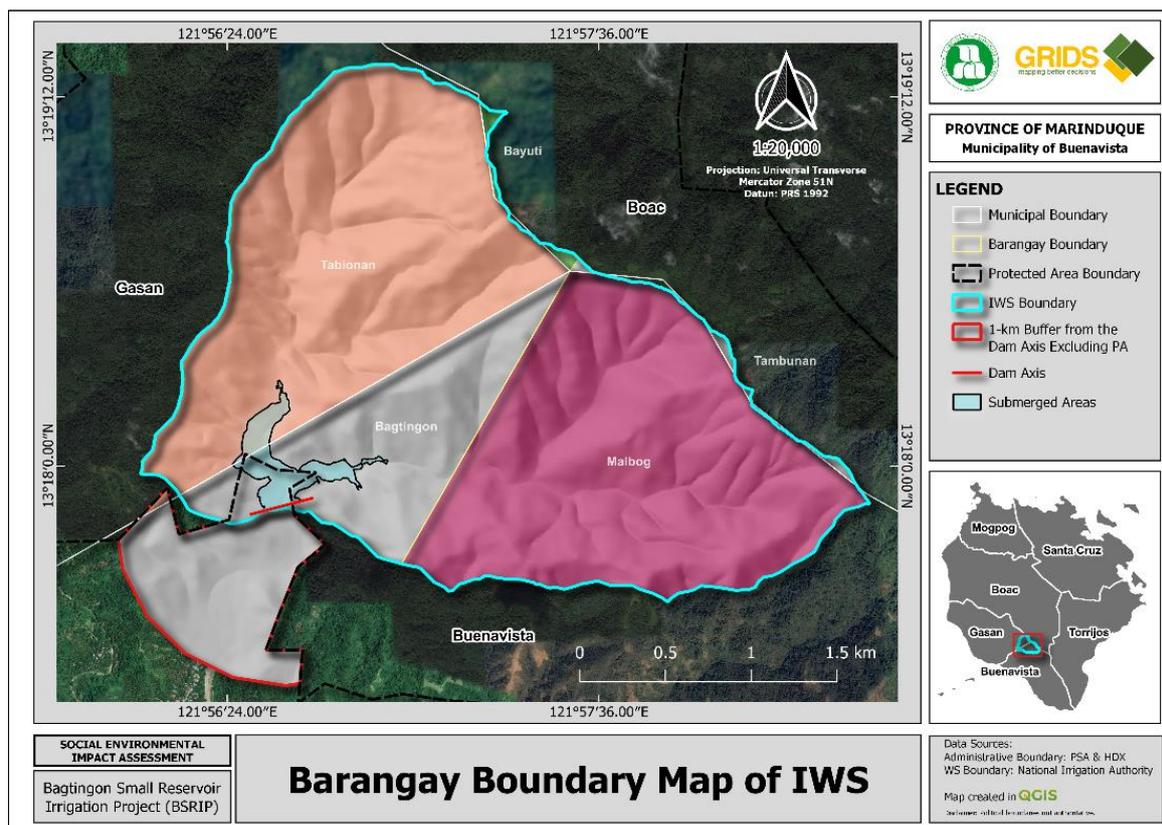


Figure 2. Barangay Boundaries within the IWS

1.2. Project Rationale

Based on the National Irrigation Master Plan (NIMP) 2020-2030, the need for rehabilitation and protection of Irrigation Water Resources (IWR) are becoming more critical on Protection and Proper Management of Irrigation water sources. It states that “... climate change has been impacting water resources watersheds and river basins that provide water to irrigation systems. These catchments and river basins have already undergone long periods of development, land use change, and degradation or depletion of environmental resources. Many watersheds are already at their critical state and their dependable water supply often proves to be inadequate to meet the irrigation water demand especially during dry season. The NIA must therefore be active in interagency collaboration to protect, develop, and manage forests and other natural resources”. Henceforward, the Department of Environment and Natural Resources and the National Irrigation Administration (DENR-NIA) Memorandum of Agreement (MOA) was crafted and approved last August 2019 to support development, protection, and management of critical irrigation water sources.

In line with this, the National Irrigation Administration (NIA), in collaboration with the Department of Environment and Natural Resources (DENR), aims to assist in the formulation of management plans for the protection and rehabilitation of Irrigation Water Sources (IWS). Ideally, management plans look at the irrigation river system’s “health” in terms of land cover, land use, cropping patterns, soil erosion, conservation practices, and related concerns to come up with appropriate practices and corresponding strategies, work targets, and cost.

The nationwide implementation of the Small Reservoir Irrigation Project (SRIP) is one of the major undertakings of the National Irrigation Administration under the 10-year Accelerated Irrigation Development Program of the national government. SRIPs are multi-oriented projects which require

the construction of medium size dams and appurtenant structures to impound water during wet season for the primary purpose of providing year-round irrigation to farmlands of farmer beneficiaries in the rural areas. Other benefits that can be derived from SRIPs include flood control, aquaculture, hydropower, domestic water supply and recreational facilities.

The proposed Bagtingon SRIP has been selected as one of the priority projects located in Buenavista, Marinduque. The selection was based on the technical soundness of the dam location, the project's readiness as to the availability of the geologic data and topographic maps and the equitable regional distribution.

The province of Marinduque specifically in the municipality of Buenavista is largely agriculture-based in economic terms. Agriculture however is threatened by a multitude of problems: rising demand for residential and commercial lands as a result of regional population growth causing agriculture land use to decline; and low productivity and farm income are among the major issues being faced by the people relying on agriculture in the project area. The root causes of which, according to barangay officials and farmers, are insufficient water for irrigation to have a second or third cropping in a year.

The Bagtingon Small Reservoir Irrigation Project (SRIP) aims to address the aforementioned concerns. It is in line with the PDP 2017-2022 goals of ensuring the sustainability of government efforts to improve the productivity of the agriculture, forestry, and fisheries (AFF) sector; to continuously build the capacity of AFF stakeholders; and to expand the access of farmers and fisherfolk to economic opportunities by improving AFF productivity within the ecological limit through, among others, accelerating construction of disaster- and climate-resilient small-scale irrigation systems and improve existing ones, facilitating the use of appropriate farm and fishery machinery and equipment, and pursuing an ecosystems approach to fisheries management.

1.3. Project Alternatives

While it may not be denied that certain benefits possibly will accrue to the Municipality of Buenavista, it could also not be denied that some people in the area will have certain apprehensions and doubts in their minds. Thus, studies on the biophysical, and socio-cultural – economic and people's perceptions and reactions have to be conducted relative to the proposed project.

If the proposed project will not be pushed through at Barangay Bagtingon, there would not be many effects, either positive or negative, on the physical environment. In addition, no adverse impact would be suffered by Barangay Bagtingon. However, there will be other significant sociological and economic losses to the municipality in general and the barangay in particular. Furthermore, failure to push through with the proposed project will affect the water industry and the economic growth of the municipality. This will put to waste the great potential of the area for tourism development.

The proponent had already made assurances of compensating those who would be affected and establishing the necessary enhancement programs of farms around the vicinity of the project. Furthermore, the development and operation of the project in the area enhance the economic growth of the whole municipality. The aim of the project proponent will be for the general good and welfare of the municipality and not purely for vested interest. Besides, those affected will have priority in employment and recruitment in the project, as long as they are fit and competent for the job.

1.4. Project Components

The proposed SRIP aims to utilize the water resources potential of the Caigangan Watershed for irrigation purposes. The BSRIP was proposed to be able to provide a sufficient supply of irrigation water to some agricultural areas in Barangays Bagtingon, Daykitin, Caigangan, Uno, Dos, Tres, Quatro, and Malbog all in the municipality of Buenavista. It involves the construction of a dam and its appurtenant structures across the Bagtingon River in Barangay Bagtingon. This could store about 102 meters of water at Normal Water Surface Elevation. The dam axis is located at geographic coordinates 13° 17' 51.89" North Latitude and 121° 56' 34.54" East Longitude. Other features would include pertinent structures such as spillways, on-farm facilities, and diversion conduit/ outlet networks (Error! Reference source not found.).

Table 2. Summary of features and performance specification of BSRIP

PROJECT DATA & FEATURES		
DETAILS	UNITS	DIMENSIONS/ FEATURES
A. MAIN DAM		
Dam Type		Zoned Embankment Dam
Hazard Classification		PHRC - 3
Maximum Dam Height	meters	27.93
Dam Crest Length	meters	226.65
Dam Crest Width (Earth)	meters	9.00
Dam Crest Elevation	meters	108.00
Riverbed Elevation	meters	80.07
Reservoir Area	has	16.90
Watershed Area	km ²	7.65
Maximum Water Surface Water Elevation	meters	105.51
Normal Water Surface Water Elevation	meters	102.00
Minimum Water Surface Water Elevation	meters	93.50
Inflow Design Flood (Q = 200yr)	m ³ /sec	310.77
Active Storage Capacity	mcm	0.64
Dead Storage Capacity	mcm	0.28
Total Storage Capacity	mcm	0.93
B. SPILLWAY STRUCTURE		
Type of spillway		Ungated
Height of spillway (ogee)	meters	1.00
Crest Length (effective)	meters	25.00
Crest Elevation	meters	102.00
Shape of Chute Section		Rectangular
Length of Chute Section	meters	242.00
Width of Chute Section	meters	25.00
Energy Dissipator (Stilling Basin)		Type II (USBR)
Shape of Stilling Basin		Rectangular
Length of Stilling Basin	meters	27.00
Length of Riprap (Boulder)		78.00
Bottom Width of Stilling Basin	meters	25.00

PROJECT DATA & FEATURES		
DETAILS	UNITS	DIMENSIONS/ FEATURES
Elevation of Stilling Basin	meters	73.00
Shape of Exit Channel		Rectangular
C. OUTLET WORKS (DIVERSION & IRRIGATION OUTLET)		
Main Canal	km	8.78
Lateral Canal	km	6.49
Design Discharge (Q = 10yr)	m ³ /sec	125.18
Type of Intake		Intake tower with trashrack
Size of Pipe Diameter	meters	2.70 (Diversion), 0.90 (Outlet)
Length of Outlet Works	meters	189.40
Water Surface at inlet	meters	94.50
Water Surface at the Start of Main Canal	meters	82.30
Diversion Outlet (Energy Dissipator)		Impact - Type

1.5. Process / Technology

An important consideration in this proposed Bagtingon SRIP establishment project is the environmental concerns. The following are various processes that the proponent plans to take on and commence in the project:

- Site preparation;
- Construction of building facilities and other civil works; and
- Dam operation

The project starts during the design stage where site selection and analysis, site utilization, land-use studies, technical feasibility studies, architectural and space programming, final design development, and contract document phase are undertaken. Then, construction activities commence such as civil works, installation of various electrical and mechanical appliances, plumbing / sanitary installations, security and management system, support facilities, and other additional works necessary to complete the work.

Construction activities will be carefully managed to protect the environment. The construction shall conform to standards of construction for ecotourism projects and should be environmentally friendly. The scale of construction of the facilities will be characterized by low to medium structural works and intensive sanitary work activities. The aesthetical value of the project site will also be given a high degree of importance. The design is such that the remaining natural areas will not be further affected.

Heavy equipment will be used only in areas that needed one or more of the following structures:

- drainage and sewerage work;
- electrical and communication lines;
- topsoil stripping or leveling; and
- building foundations

1.6. Project Size

The project envisaged the construction of a 27.93- meter high- zoned embankment dam at the riverbed with an elevation of 80.07 meters. The crest length of the dam is 226.65 meters at an elevation of 108 meters above sea level. At its maximum water capacity, the water is estimated to extend 400 meters upstream of Manlawanin and 300 meters upstream of Subling, reckoned from the dam axis level. The impounded water will be used to provide irrigation water for about 226 ha of agricultural lands in seven barangays. It is located just a few meters downstream from the confluence of the Manlawanin and Subling Rivers which is eventually called the Bagtingon River as it approaches the Tablas Strait.

The proposed spillway of the dam is located on the right bank of the river facing downstream. The width of the spillway is 136.93 meters throughout its length of 192 meters. The inlet portion is a straight ungrated ogee crest type, 1.00 meters in height; a guide portion of the rectangular chute type, and a 32-meter long energy dissipater of the USBR-Type III stilling basin. The spillway is designed with a return period of a 100-year flood, which is 138.17 cubic meters per second.

The outlet work structure shall also serve as the diversion conduit during construction. The regulating portion will be located between the downstream end of the conduit and the energy dissipater and the irrigation water is directly discharged into the irrigation canal. The drainage network includes the construction of near-farm drains to provide conveyance of excess irrigation water and runoff discharges into existing waterways.

The Main Canal will deliver water requirements to an area of 226 hectares. A corresponding 8.78 kilometers length of the Main Canal and 6.49 kilometers of Laterals will deliver the water requirement for its service areas in barangays of Bagtingon, Daykitin, Caigangan, Uno, Dos, Quatro, and Malbog. The Main Canals and Laterals conveniently designed along existing roadways greatly minimized the construction of service roads. A canal service road along the right bank of the Main Canal provides access to the service areas.

1.7. Development Plan, Description of Project Phases, and Corresponding Timeframes

1.7.1. Pre-construction

During the pre-construction stage, the proponent shall undertake, and accomplish, the following activities:

- Conduct the required Environmental Impact Assessment (EIA) and secure an Environmental Compliance Certificate (ECC) for the project.
- Perception Survey and IEC Action Program
- Public Scoping

1.7.2. Construction Plan / Schedule

The construction of Bagtingon SRIP in Buenavista, Marinduque is scheduled for three (3) years. This is in line with the established criteria by SRIP that a dam with a height of more than 15 meters shall have a construction period of three (3) dry seasons. The major components in the project are dam spillway outlet works, camp facilities, and construction of permanent and temporary access roads, and utilities shall immediately follow.

Upon completion of the preparatory works especially in survey and Right-of-way (ROW) negotiations, the construction of the civil works shall then proceed. Each major component shall have

a separate construction crew and heavy equipment. The sequence activities for each major component in relation to the others are discussed as follows:

Dam – The clearing, grubbing, and stripping shall start before the onset of the rainy season. The core trench excavation shall follow simultaneously. The river section shall be continued as the last stretch. Upon attaining the design elevation, the trench channel section, drilling, and grouting shall immediately follow. The start of this activity shall fall at the start of the rainy season and should be finished at the end of the first year.

Embankment activities shall start at the right abutment where the drilling and grouting have been completed. Upon completion of the concreting works and other activities at the outlet, the embankment shall continue at the right abutment, and slope towards the river.

In January of the 3rd year, the original flow of the river shall be diverted to the outlet works. All other components such as the intake tower, valve house, and stilling basin should be completed by then. Likewise, the cofferdam crest elevation at 27.50 meters should have been completed. The closure dam shall be constructed during this month and continued up to the crest elevation of the dam until November of the 3rd year.

Spillway – The foundation excavation and channel formation for the spillway shall start simultaneously with the dam core trench excavation in March of the 1st year. The preparatory works such as filter drain, anchor bars, reinforcing bars, and formworks shall follow immediately after attaining the designed channel floor elevations. The concreting of the spillway chute down to the stilling basin should be given priority and should be finished before the start of the rainy season in May of the 2nd year. This is to avoid the problem of dewatering.

Outlet Works – The foundation excavation for the pipe conduit shall also start in March of the 1st year. The preparatory works should be ready for the start of concreting of the pipe conduit. Simultaneous activities shall be undertaken at the intake tower, valve house, and stilling basin. River diversion shall be conducted in January of the 3rd year, so it is of prime importance that the activities at the outlet works be finished beforehand.

Irrigation Drainage – The construction of the irrigation and drainage facilities shall start immediately after having cleared ROW and also after having completed the construction drawings. The irrigation and drainage component is expected to be finished in October of the 3rd year, in time for the test run and completion of the project within the prescribed duration of 3 years.

1.7.3. Operation Phase

1. Dam Operation

The operation of the reservoir, dam, and its appurtenant structures includes a series of works before normal use. These are works to be done prior to the initial storage, from the end of the full storage to the steady behavior onwards.

These preparatory works or inspection works must confirm that the dam, spillway, and outlet works are completed and/or sufficiently functioning.

Besides the operational preparations, the other works include the release of water from the reservoir for irrigation and other purposes and the emergency release of excess water during periods of heavy rains and anticipated flooding.

2. Dam Maintenance

The reservoir, dam and its appurtenant structures have to be well maintained to keep the facilities functioning, as long as possible. Any damage or breach to these facilities should be prevented to protect the people from dangerous deluge/overflow. The maintenance works of the dam are divided into three (3) categories, which are as follows:

- a.) **Routine Works** – These include the routine inspection of the dam, its appurtenant structures, and vicinities to check leakage, seepage, and shrinkage or deformation of the dam body and record the data gathered from the dam instrumentation and seepage weir.
- b.) **Periodic Works** – These include the removal of floating obstacles around the control gates/valves, repair and refilling of undulation of dam crest and slopes, and the moving or cutting of shrubs and grasses on dam slopes.
- c.) **Emergency Repairs** – These are the repairs needed to the damaged facilities and structures caused by unusual weather or geological disturbance like very strong rains, big floods, or devastating earthquakes.

3. Operation of the Irrigation System

Operation of the irrigation system refers to the appropriate adjustment and proper utilization of the facilities, which includes the proper distribution of the irrigation water at the turnout and division boxes and the prevention of the water overtopping the canals and ditches.

4. Maintenance of the Irrigation System

The maintenance works of the irrigation system are, likewise, divided into three (3) categories similar to the dam maintenance which are as follows:

- a.) **Routine Works** – These works include the cutting of grasses at the canals and ditches particularly at the inner section prior to regular irrigation.
- b.) **Periodic Works** - These works include the repairs of the canals and ditches, removal of silt inside the canal prism, removal of debris in the canals and other structures, and repair of upstream and downstream transition and projection works of structures. The work should be done before the start or after the cropping season, that is, during the pre-irrigation or post-irrigation stage.
- c.) **Emergency Repairs** – These are the repairs which may include partial breach or break of canals and ditches due mainly to the overtopping of excessive water supply and collapse of cross drains, road crossings, etc. caused by unusual weather or geological disturbance like very strong rains, floods, or devastating earthquakes.

1.7.4. Abandonment Phase

Upon the completion of Bagtingon SRIP, the operation and maintenance of the dam and its appurtenant structures, and irrigation facilities shall be the responsibility of NIA – MOMARO IMO with technical assistance from NIA – Central Office.

The concerned parties shall also be responsible for the implementation of environmental measures in their respective areas of concern.

1.8. Manpower

Labor and employment become competitive among the local residents due to the migrants settling in the area. The competition in labor opportunities may lead to the cheapest cost of labor. Thus, the labor force will be hired within the nearest barangay, and consequently adjoining barangays of Bagtingon, Buenavista, Province of Marinduque. The required workforce will be hired within the barangay and, consequently, adjoining barangays if not available from within the community. Other skilled employees include (1) project engineer, (1) material engineer, (1) safety officer, and (3) foreman.

The pay scale for workers will be based on the regional wage standard. These local manpower requirements will boost the LGU's income and may trigger other livelihood opportunities within the community concerned of the municipality.

1.9. Project Cost

The proposed Bagtingon – Small Reservoir Irrigation Project will cost Seven Hundred Thirty Million Pesos (Php 730,000,000.00).