



Guidelines for supporting Landless Households

Fostering Climate Resilient
Upland Farming System in the
NorthEast

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1.0 Land allocation processes:

The Lead Farmer and the Village Field Assistant of FOCUS working with the line departments shall mobilize FIG-Landless comprising landless farmers (farmers without tenurial rights). Each FIG-Landless to consist of about 10-20 farmers with one member per family and a management committee comprising four persons shall be established with 50 percent participation of women.

Each landless household in the project area mobilized into FIGs-Landless shall get support for developing at least 0.5 ha per member subject to availability of adequate land. Each FIG-Landless shall be eligible for Rs 30,000 FIG support and this shall be used for purchase of farm implements and account keeping registers and for undertaking other preliminary expenditure related to land preparation activities. This FIG support shall be released after formation of FIG-Landless, opening bank account by the FIG-Landless and getting land allocation from the Village Council. The Lead Farmer and the Village Field Assistant of FOCUS working with the line departments shall mobilize FIG-Landless comprising landless farmers (farmers without tenurial rights). Each FIG-Landless to consist of about 10-20 farmers with one member per family and a management committee comprising four persons shall be established with 50 percent participation of women.

- i. Farmers shall be encouraged in the farming of horticulture crops, timber and multi-purpose trees which will provide short-term, mid-term and long-term returns from the land, aid in improving climate resilience and ensure longer and better utilization of land.
- ii. Farmers under these FIGs will be encouraged to cultivate seasonal horticulture crops viz. papaya, cauliflower, etc. as short-term investments.
- iii. Field staff of FOCUS and FIG-Landless shall conduct consultation with the Village Councils and identify land suitable for nursery management, bunding, bench terracing and water harvesting structures for allocation to landless.
- iv. A land parcel will be identified and temporary pass will be issued for at least 0.5 ha per member. This allocation will be made not individually but for a group as a whole. .
- v. FIGs will be provided training on improved farming methods, better agro-techniques and improved planting material for horticultural crops and timber and multi-purpose trees.
- vi. Boundaries for the identified land shall be fixed after measurement and latitude and longitude of the boundaries shall record. A map prepared indicating allocation of about 0.5 ha to each member and boundaries of land parcel allocated to each member shall be recorded and physically demarcated.
- vii. Thereafter, the proposal for land allocation is placed before the Village Council and a resolution is passed by the Village Council giving consent to allocate land to the FIG-Landless.
- viii. DMU, FOCUS shall facilitate FIGs-Landless to apply to the Revenue Department for issue of temporary patta after undertaking land development.
- ix. A lumpsum of Rs 32,380 shall be eligible for the mentioned above works. The funds shall be released from the DMU after measurement, latitude, longitude, physical land demarcation is done and a resolution is passed by the Village Council giving consent to allocate land to the FIG-Landless.
- x. The field staff of FOCUS thereafter shall facilitate the FIGs-Landless to submit an application to DMU requesting release of FIG support of Rs 30,000. The project shall release FIG support by crediting the same bank account of FIG-Landless who shall use this fund for buying agriculture implements and other preparatory land development activities
- xi. Field staff thereafter shall facilitate FIGs-Landless to prepare and submit a proposal providing details of investment costs, amount to be invested by the members and the amount requested from the project along with a report from FOCUS field staff on the status of land allotment by the Village Council, and a report on utilization of FIG Support of Rs 30,000 released and member contribution collected along with latitude and longitude coordinates of the land allocated to DMU with a request to provide project support for nursery management, bunding, bench terracing, water harvesting structures and other irrigation structures, and seedlings for trees, fodder and other crops.
- xii. All the documents are to be submitted and maintained by the DMU.
- xiii. The Project Procurement Community Guidelines should be followed for Land Allocation Processes under Support to Landless Households.

- xiv. FIGs-Landless shall be facilitated by the FOCUS staff to submit a proposal seeking project support for purchase of seedlings and seed along with quantum of seedlings and seeds to be procured, sources of seed purchase, total amount required, member contribution if any and support requested from the project. This request will be processed by the project and the amount will be released to the bank account of FIGs-Landless. Farmers will be encouraged to plant leguminous trees and fast growing tree species and grasses, such as Gliricidia, Tephrosia, Flemingia, and vetiver / lemongrass on the bunds to stabilize the bunds. FIGs-Landless shall be facilitated by the project to give seeds and seedlings to the members on a loan basis to be recovered either in kind or cash and the amount recovered from the members will have to be deposited back into the bank account of FIGs-Landless for purchase of seeds, seedlings and agriculture machinery in the future.

2.0 Mode of financing – Fund flow

- a. The project shall provide funds for and operation from PMU to DMU and to FIGs on the basis of proposal made by the FIGs which is approved by the DMU and PMU.
- b. Any additional funds to be made available should be as per requisition made from FIGs.

3.0 Support to landless:

Each landless household in the project area mobilized into FIGs-Landless shall get support for developing 0.5 ha of bunding subject to availability of adequate land.

- i. Each FIG-Landless shall be eligible for Rs 30,000 FIG support and this shall be used for purchase of farm implements and account keeping registers and for undertaking other preliminary expenditure related to land preparation activities. This FIG support shall be released after formation of FIG-Landless, opening bank account by the FIG-Landless and getting land allocation from the Village Council.
- ii. The unit cost per 0.5 ha of bunding is estimated at Rs 2,500 and the FIG-Landless members are required to contribute 15 percent. The project shall release Rs 2,125 and the farmers will have to contribute Rs 375.
- iii. The project's share for construction of bunding shall be released after FIG-Landless utilizes FIG support of Rs 30,000 and preliminary land development activities have been undertaken as verified by field staff of FOCUS (TO/SaC).

4.0 Project Benefits

- a) To facilitate land for landless household where they can practice farming.
- b) To provide a reliable source of income for landless household and increase their income.
- c) To promote locally produced agricultural products for local market.
- d) Social benefits and economic upliftment of rural livelihood

5.0 Selection Criteria:

The selection criteria for the landless will include household that:

- i. have participated in jhuming for the last three years continuously;
- ii. do not have temporary pass and land settlement certificate for any land other than residential plot;
- iii. do not have any member working in the government sector;
- iv. are dependent on wage labour for 75% of their income. FIG in each village comprising about 10-20 members will be established and supported by the Lead Farmer.

6.0 Implementation arrangement:

The Lead Farmer and the Village Field Assistant of FOCUS working with the line departments shall mobilize FIG-Landless comprising landless farmers (farmers without tenurial rights). Each FIG-Landless to consist of about 10-20 farmers with one member per family and a management committee comprising four persons shall be established with 50 percent participation of women.

- i. Field staff of FOCUS and FIG-Landless shall conduct consultation with the Village Councils and identify land suitable for bunding for allocation to landless. Boundaries for the identified land shall be fixed after

measurement and latitude and longitude of the boundaries shall recorded. A map prepared indicating allocation of about 0.5 ha to each member and boundaries of land parcel allocated to each member shall be recorded and physically demarcated. Thereafter, the proposal for land allocation is placed before the Village Council and a resolution is passed by the Village Council giving consent to allocate land to the FIG-Landless.

- ii. Upon getting consent from the Village Councils for land allocation, each FIG-Landless shall open a bank account and deposit initial member contribution of Rs 375 per member being 15% of the unit cost of Rs 2,500 for 0.5 ha per member. Field staff of FOCUS to verify deposit of member contribution to the bank account of FIG-Landless.
- iii. The field staff of FOCUS thereafter shall facilitate the FIGs-Landless to submit an application to DMU requesting release of FIG support of Rs 30,000. The project shall release FIG support by crediting the same the bank account of FIG-Landless who shall to use this fund for buying agriculture implements and other preparatory land development activities.
- iv. Field staff thereafter shall facilitate FIGs-Landless to prepare and submit a proposal providing details of investment costs, amount to be invested by the members and the amount requested from the project along with a report from FOCUS field staff on the status of land allotment by the Village Council, and a report on utilization of FIG Support of Rs 30,000 released and member contribution collected along with latitude and longitude coordinates of the land allocated to DMU with a request to provide project support for bunding. Out of the total unit cost of Rs 2,500 per 0.5 ha, the project shall provide Rs 2,125 per 0.5 ha and the balance shall be contribution from the members.
- v. Thereafter within 30 days of release of fund, FOCUS officials will have to obtain a utilization certificate from the FIG-Landless for the amount released and file a completion certificate for the entire bunding support with copies of measurement book.
- vi. The works carried out under this support to FIGs-Landless shall be monitored by (TO, LR,S&WC)/ SAC/VLWs with the supervision of experts from district LR, S&WC Department.
- vii. At the time of construction the bunds, the Village Field Assistant should verify the size of the bunds by randomly checking whether the bunds have been across the contour as far as possible.
- viii. The length and breadth of the bunds will have to be measured by the Village Field Assistant for determining the volume of earth work.
- ix. Measurement is recorded in the measurement book to be maintained by the Village Field Assistant and it will be the basis for preparing utilization certificates.
- x. Once the bunds and bench terracing have been constructed and completion certificate submitted, FIGs-Landless shall become eligible to submit proposals for construction of water harvesting structures/irrigation structures. The field staff shall assist the FIGs-Landless in preparation of cost estimates for these structures.
- xi. FOCUS officials shall facilitate FIGs-Landless to apply to the Revenue Department for issue of temporary patta after undertaking land development.
- xii. FIGs-Landless shall be facilitated by the FOCUS staff to submit a proposal seeking project support for purchase of seedlings and seed along with quantum of seedlings and seeds to be procured, sources of seed purchase, total amount required, member contribution if any and support requested from the project. This request will be processed by the project and the amount will be released to the bank account of FIGs-Landless. Farmers will be encouraged to plant leguminous trees and fast growing tree species and grasses, such as Gliricidia, Tephrosia, Flemingia, and vetiver / lemongrass on the bunds to stabilize the bunds. FIGs-Landless shall be facilitated by the project to give seeds and seedlings to the members on a loan basis to be recovered either in kind or cash and the amount recovered from the members will have to be deposited back into the bank account of FIGs-Landless for purchase of seeds, seedlings and agriculture machinery in the future.
- xiii. Maintenance of the bunding will be the responsibility of the members.
- xiv. The Project Procurement Community Guidelines should be followed for all activities under Support to Landless Households.



7.0 Bunding

7.1 Definition and description

It consists of building earthen embankments across the slope of the land, following the contour as closely as possible. A series of such bunds divide the area into strips and act as barriers to the flow of water, thus reducing the amount and velocity of the runoff. It has been used extensively to control soil erosion and promote water retention and increase crop productivity. Since it is made of local resources, it is low cost and can be replicated on large scale. Contour bunds are constructed along contour lines. They are usually made of stones or soil (sometimes with the remains of the crops). They are built along the contour lines for slowing down the flow of rainwater /water on the slopes and prevent soil erosion.

The contour lines in the field are marked using “A” frame or water level and the lines marked using wooden / bamboo pegs. The soil from above the contour lines is used for making the bunds. In case stones are available, they can also be used for making contour bunds. Planting of grasses and leguminous tree species stabilizes these bunds.

7.2 Types of bunding and criteria for selection

Bunds are of two types: (1) Contour bund and (2) Graded bund

(1) Contour Bund

When the bunds are constructed following the same contour, they are called contour bunds. Fig 24.1 shows the layout of contour bunds in the field. Contour bunds are recommended for areas with low annual rainfall (<600 mm), agricultural field with permeable soil and having a land slope < 6%. The major requirements in such areas are prevention of soil erosion and conservation of rain water in the soil for crop use.

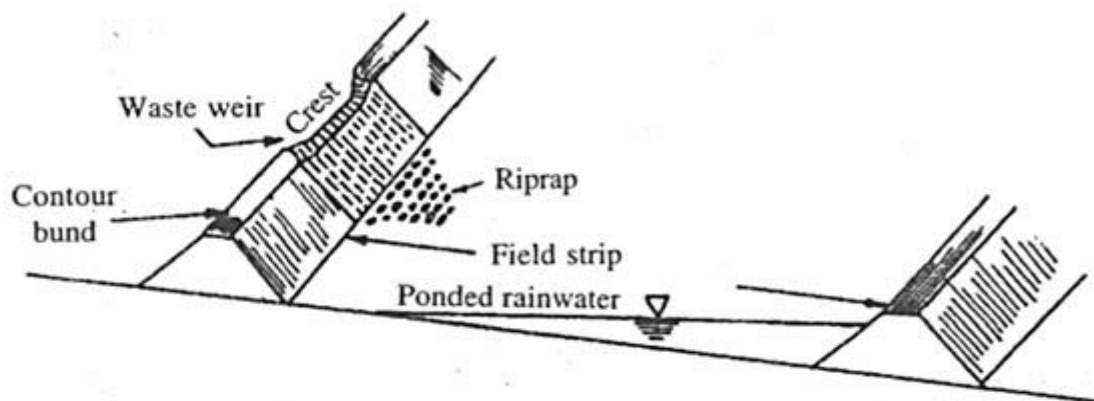


Fig. Layout of contour bunds in field. (Source: Das, 2002)

Contour bund absorbs the runoff water stored at the upstream side of the bund. Proper height of the bund is necessary to avoid overtopping during floods. During monsoon, even in a low rainfall region, the entire runoff water cannot be stored and the excess is liable to flow over the bund. To avoid damage, waste or surplus weir (Fig. 24.2) is provided on the bunds to dispose off excess water into the next bund. This prevents water-logging.

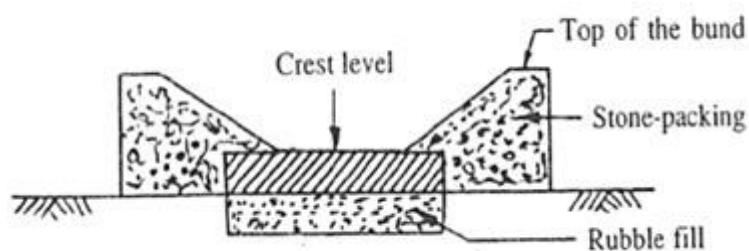


Fig. Clear overfall stone weir.

Contour bunding can be adopted on all types of permeable soil except for the clayey or deep black cotton soils as these soils have the problem of crack development causing bund failure. Clayey soil also has the problem of water-logging near the bund section, which makes the bund construction infeasible.

(2) Graded Bund

When a grade is provided along the bund for safe disposal of runoff water over the area between two consecutive bunds, they are called graded bund. Graded bunds are adopted in case of high or medium annual rainfall (>600 mm) and relatively less permeable soil areas. Graded bunds are designed to dispose excess runoff safely from agricultural field.

7.3 Objectives

- To reduce run-off or its velocity and to minimize soil erosion.
- To conserve soil moisture and fertility and to facilitate modern cropping operations i.e. mechanization, irrigation and transportation on sloping land.
- To promote intensive land use and permanent agriculture on slopes and reduce shifting cultivation.

7.4 Locations and conditions for use

Generally speaking, bunding are particularly suited to countries or communities with the following macro conditions:

- Severe erosion hazards.
- Areas with small holdings and a dense population.
- Areas where there are food shortages or high unemployment rates.

For micro or site conditions, bunding is suitable in the following cases:

- Where there are relatively deep soils.
- On slopes not exceeding 40 degrees.
- On sites which are not dissected by gullies and not too stony.

Bench terraces are much more cost-effective if there is potential for mechanization, irrigation and for growing high-value crops.

7.5 Layout and surveying procedures

The layout of bunds should include an examination of the site's physical conditions e.g. slope, soil depth, texture, erosion, presence of rocks, wetness, vegetation cover and present land use. The layout design should include specifications of the bunds (or treatments), sites and types of waterways, sites of roads and other farm installation needs. Human factors such as the farmer's plans and resources, labour conditions, and the tools to be used, must also be considered.

7.6 Surveying

7.6.1 Preparatory work

This entails brushing the area, preparing survey equipment, stakes, colour ribbons or markers, and deciding on survey methods and sequences.

7.6.2 Equipment

The equipment usually consists of the following:

- Dumpy level, abney level or A-level.
- Measuring tape and rod.
- Soil auger.

7.6.3 Basic techniques

- For level bunds: use contouring or levelling techniques.

7.6.4 Marking stakes

Each contour line of stakes should be marked with a different colour ribbon or paint in order to avoid confusion during construction, (e.g. centre lines in red, and side lines in yellow or green, etc.).

7.7 Construction methods

The cut and fill of the bunds should be done gradually and at an equal pace so that there is neither an excess nor a lack of soil. This principle applies regardless of what kind of tools is used for the operation.

Construction of bunds should start from the ridge and continue down the valley. This will ensure protection of the bunds if rains occur during construction. The base width area of the bund should be cleared of vegetation and the soil in this area should also be slightly distributed so that good binding can be achieved when the bund is formed over it. The burrow pits for the soil are generally located on the upstream side of the bund. It should have a uniform depth of 30 cm and the width can be varied as per necessity. The burrow pits should be continuous and no breaks are to be left. The burrow pits should not be located in a gully or depression. When the soil is dug, the clods should not be put on the bund at a time. The earth should be put in layers of 15 cm and consolidated by trampling. The templates of the specified dimensions are used for checking the bund section. The bund section should be finally shaped, trimmed and slightly rammed on the top and the sides. After the bund formation, it is desirable to plough the field and the burrow pit.

7.8 By manual labour

The bunds must be built when the soil is neither too dry nor too wet. Start building the bunds from the top of a hill and proceed downslope. It will not be washed away in the case of heavy rain. However, when topsoil treatment or preservation is carried out, it is necessary to start building from the bottom of the hill upwards. In this case, temporary protection measures should be undertaken.

Both the reverse and horizontal grades should be checked by a level during construction work and corrections must be made promptly wherever necessary. The slope of the riser should be shaped to 1:1.

7.9 Protection and maintenance

New bunds should be protected at their risers and outlets and should be carefully maintained, especially during the first two years.

7.9.1 Protection

After construction, the bunds should be shaped and planted with grass as soon as possible. Sod-forming, or rhizome-type grasses are better than those of the tall or bunch-type. Although tall grasses may produce considerable forage for cattle, they require frequent cutting and attention. The rhizome-type of local grass has

proved very successful in protecting risers. Stones, when available, can also be used to protect and support the bunds. An additional protection method is hydro-seeding.

7.9.2 Maintenance

Bunding require regular care and maintenance. If a small break is neglected, large-scale damage will result. Following is a list of maintenance work that should be carried out after heavy storms and cropping, especially in the first two years period.

7.10 Soil productivity

Deep ploughing, ripping or sub-soiling is needed to improve the structure of the soils on the cut part of the bunding. Green manuring, compost or sludge is needed in the initial period in order to increase soil fertility. Soil productivity should be maintained by means of proper crop rotation and the use of fertilizers.

7.11 Support to landless:

Each landless household in the project area mobilized into FIGs-Landless shall get support for developing 0.5 ha of bunding subject to availability of adequate land.

- i. The unit cost per 0.5 ha of bunding is estimated at Rs 2,500 and the FIG-Landless members are required to contribute 15 percent. The project shall release Rs 2,125 and the farmers will have to contribute Rs 375.
- ii. The project's share for construction of bunding shall be released after FIG-Landless utilizes FIG support of Rs 30,000 and preliminary land development activities have been undertaken as verified by field staff of FOCUS (TO/SaC).

7.12 Implementation arrangement:

- i. Field staff of FOCUS and FIG-Landless shall conduct consultation with the Village Councils and identify land suitable for bunding for allocation to landless. Boundaries for the identified land shall be fixed after measurement and latitude and longitude of the boundaries shall recorded. A map prepared indicating allocation of about 0.5 ha to each member and boundaries of land parcel allocated to each member shall be recorded and physically demarcated. Thereafter, the proposal for land allocation is placed before the Village Council and a resolution is passed by the Village Council giving consent to allocate land to the FIG-Landless.
- ii. Upon getting consent from the Village Councils for land allocation, each FIG-Landless member shall deposit member contribution of Rs 375 per member being 15% of the unit cost of Rs 2,500 for 0.5 ha per member for bunding. Field staff of FOCUS to verify deposit of member contribution to the bank account of FIG-Landless.
- iii. Field staff thereafter shall facilitate FIGs-Landless to prepare and submit a proposal of land for bunding with a request to provide project support for bunding. Out of the total unit cost of Rs 2,500 per 0.5 ha, the project shall provide 85% i.e. Rs 2,125 per 0.5 ha and the remaining balance shall be contribution from the members.
- iv. Thereafter within 30 days of release of fund, FOCUS officials will have to obtain a utilization certificate from the FIG-Landless for the amount released and file a completion certificate for the entire bunding support with copies of measurement book.
- v. The works carried out under this support to FIGs-Landless shall be monitored by SAC/VLWs with the supervision of experts from district LR, S&WC Department.
- vi. At the time of construction the bunds, the Village Field Assistant should verify the size of the bunds by randomly checking whether the bunds have been across the contour as far as possible.
- vii. The length and breadth of the bunds will have to be measured by the Village Field Assistant for determining the volume of earth work.
- viii. Measurement is recorded in the measurement book to be maintained by the Village Field Assistant and it will be the basis for preparing utilization certificates.
- ix. DMU, FOCUS shall facilitate FIGs-Landless to apply to the Revenue Department for issue of temporary patta after undertaking land development.
- x. Maintenance of the bunding will be the responsibility of the members.

7.13 STANDARD SCHEDULE OF RATES FOR BUNDING UNDER FOCUS MIZORAM

Analysis of Rate for construction of bunding on 30 - 40 % sloping land per 0.50 Ha. in Mizoram 'A' NOTES

1. Area = 50m x 50m (SAY)
2. Bunds -
 - Bottom width - 0.220 m
 - Top width - 0.150 m
 - Depth - 0.170 m
 - Length - 50 m
 - Quantity - $[\frac{1}{2} \times (0.24 + 0.15) \times 0.17] \times 50 = 1.66 \text{ m}^3$
3. Horizontal Interval (H.I) = 10 m
4. No. of rows of bunds per Ha = 50m/10m = 5 nos.
5. Total earthwork : $1.66 \text{ m}^3 \times 5 \text{ nos.} = 8.3 \text{ m}^3$
6. Earthwork items are based on Mizoram PWD Schedule of Rate 2019 cost Index

Cost of Items of Works per Hectare -

(Based on Mizoram PWD SOR,2019)

- 1/2.03 Earthwork in excavation exclusive of compensation of earth in
a) ordinary soil -
i) Kassi work undressed involving an average horizontal throw upto 2m and an average vertical lift upto 0.50m including breaking of clods
 8.30 m^3
@ **Rs. 118.40/m³** ----- = **Rs. 982.72**
- 2/2.18 Filling available excavated earth in trenches, plinth, sides of foundation etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering
etc. - 8.30 m^3
@ **Rs. 129.50/m³** ----- = **Rs. 1074.85**
- TOTAL = Rs. 2057.57**

Other Items of work per Hectare

1. Contour Survey and demarcation (1 man days)
@ **Rs. 500.00/day** ----- = **Rs. 500.00**

GRAND TOTAL = Rs. 2,557.57

SAY : = Rs. 2,500.00
(Rupees two thousand five hundred) only

** The project shall release Rs 2,125 (85% of Rs 2,500 for supporting 0.25 Ha out of the identified 0.5 Ha) and the balance Rs 375 (15% of Rs 2,500 for supporting 0.25 Ha out of the identified 0.5 Ha) shall be the contribution of beneficiary.*



8.0 Bench terracing

8.1 Definition and description

Bench terraces are a series of level or virtually level strips running across the slope at vertical intervals, supported by steep banks or risers.

8.2 Types of bench terraces and criteria for selection

The following are two main types of bench terraces:

- Irrigation or level bench terraces: These are used where crops, such as rice, need flood irrigation and impounding water.
- Upland bench terraces: These are used mostly for rain-fed crops or crops which only require irrigation during the dry season. They are generally sloped for drainage.

In humid regions: Use reverse sloped type.

In arid or semi-arid regions: Use outward-sloped type.

8.3 Objectives

- To reduce run-off or its velocity and to minimize soil erosion.
- To conserve soil moisture and fertility and to facilitate modern cropping operations i.e. mechanization, irrigation and transportation on sloping land.
- To promote intensive land use and permanent agriculture on slopes and reduce shifting cultivation.

8.4 Locations and conditions for use

Generally speaking, bench terraces are particularly suited to countries or communities with the following macro conditions:

- Severe erosion hazards.
- Areas with small holdings and a dense population.
- Areas where there are food shortages or high unemployment rates.
- Areas where crops require flood irrigation.

For micro or site conditions, bench terracing is suitable in the following cases:

- Where there are relatively deep soils.
- On slopes not exceeding 40 degrees.
- On sites which are not dissected by gullies and not too stony.

Bench terraces are much more cost-effective if there is potential for mechanization, irrigation and for growing high-value crops.

8.5 Layout and surveying procedures

The layout of terraces should include an examination of the site's physical conditions e.g. slope, soil depth, texture, erosion, presence of rocks, wetness, vegetation cover and present land use. The layout design should include specifications of the terraces (or treatments), sites and types of waterways, sites of roads and other farm installation needs. Human factors such as the farmer's plans and resources, labour conditions, and the tools to be used, must also be considered.

8.6 Surveying

8.6.1 Preparatory work

This entails brushing the area, preparing survey equipment, stakes, colour ribbons or markers, and deciding on survey methods and sequences.

8.6.2 Equipment

The equipment usually consists of the following:

- Dumpy level, abney level or A-level.
- Measuring tape and rod.
- Soil auger.

8.6.3 Basic techniques

- For level terraces: use contouring or levelling techniques.
- For upland bench terraces: use graded-contouring techniques.

8.6.4 Marking stakes

Each contour line of stakes should be marked with a different colour ribbon or paint in order to avoid confusion during construction, (e.g. centre lines in red, and side lines in yellow or green, etc.).

8.7 Construction methods

The cut and fill of the terraces should be done gradually and at an equal pace so that there is neither an excess nor a lack of soil. This principle applies regardless of what kind of tools are used for the operation.

8.7.1 By manual labour

The terrace must be built when the soil is neither too dry nor too wet. Start building the terrace from the top of a hill and proceed downslope. It will not be washed away in the case of heavy rain. However, when topsoil treatment or preservation is carried out, it is necessary to start building from the bottom of the hill upwards. In this case, temporary protection measures should be undertaken.

Tie cord or rope around the stakes to mark each constructed terrace in sequence. The initial cut must be made immediately below the top stakes while the fill work should be started against the bottom stakes. This is done in order to ensure that the correct grade is attained without overcutting. Sometimes, rocks or clods of earth can be placed along the bottom line of the stakes to serve as a foundation before filling. During the filling operation, the soil should be compacted firmly by a beater every 15 cm. If the layer of soil fill is thick, the compacting process becomes difficult. Terraces which go across existing depression areas should be built particularly strong. The edge of a terrace should be built a little higher than planned because of settling. The rate of settling may be as high as 10% of the depth of the fill.

Both the reverse and horizontal grades should be checked by a level during construction work and corrections must be made promptly wherever necessary. The slope of the riser should be shaped to 0.75:1. Waterway shaping should be commenced only after the terraces are cut. Make sure all the terrace outlets are higher than the waterway bottom.

8.8 Topsoil treatment or preservation

Bench terraces usually expose the infertile subsoil and this can result in lower production unless some prevention or improvement measures are undertaken. One such measure is topsoil treatment or preservation. When fertile topsoil exists, topsoil treatment is always worthwhile. Two alternative methods follow:

- The terraces should be built from the bottom of the slope upwards. After the bottom terrace is roughly cut, the topsoil from the slope above is then pulled down to the bench and spread on top of it. Repeat this procedure for the next terrace up the slope and proceed uphill in this way until the top terrace is built. The top terrace will not have topsoil unless it is obtained from another place.
- The second method is to push the topsoil off horizontally to the next section before cutting the terrace. The topsoil should be pushed back when the cutting is completed. For hand-made terraces, the topsoil can be piled along the centre line provided that the bench is wide enough.

8.9 Physical output

8.9.1 By manual labour

Generally-speaking, a man can cut and fill 3 to 4 cubic m of earth during eight hours of supervised work, although output may vary depending on the type of soil and if rocks are present. If a terrace is wider than 4 m, output will be reduced because the transporting of the earth requires extra time. A team of 3 men for narrow terraces and 4 men for wider terraces is recommended for efficient terracing work. In the case of wider terraces, two men should be employed for cutting, the third for compacting and consolidating the risers, and the fourth for transporting the dirt.

8.10 Protection and maintenance

New terraces should be protected at their risers and outlets and should be carefully maintained, especially during the first two years.

8.10.1 Protection

After cutting a terrace, its riser should be shaped and planted with grass as soon as possible. Sod-forming, or rhizome-type grasses are better than those of the tall or bunch-type. Although tall grasses may produce considerable forage for cattle, they require frequent cutting and attention. The rhizome-type of local grass has proved very successful in protecting risers. Stones, when available, can also be used to protect and support the risers. An additional protection method is hydro-seeding.

The outlet for drainage-type terraces is the point where the run-off leaves the terrace and goes into the waterway. Its gradient is usually steep and should be protected by sods of earth. A piece of rock, a brick, or a cement block, is sometimes needed to check the water flow on steeper channels. Similar checks on water flow are required for level bench terraces where the water falls from the higher terraces onto those below. A piece of rock should be placed on the lower terrace to dissipate the energy of the following water. Grasses should also be established on the area of the bench crossed by the waterway.

8.10.2 Maintenance

Bench terraces require regular care and maintenance. If a small break is neglected, large-scale damage will result. Following is a list of maintenance work that should be carried out after heavy storms and cropping, especially in the first two to three years period:

8.11 Benches

The toe drains should be always open and properly graded; water must not be allowed to accumulate in any part of the terrace. All run-off should be allowed to collect at the toe drains for safe disposal to the protected

waterway. Obstacles such as continuous mounds or beds must be removed at regular intervals to allow water to pass to the toe drain. Grasses and weeds should be removed from the benches. Correct gradients should be maintained and reshaped immediately after crops are harvested. Ploughing must be carried out with care so as not to destroy the toe drains and the grade.

8.12 Risers

Keep grasses growing well on the risers. Weeds and vines which threaten the survival of the grasses should be cut back or uprooted. Grasses should not be allowed to grow too high. Any small break or fall from the riser must be repaired immediately. Cattle should not be allowed to trample on the risers or eat the grass. Runoff should not be allowed to flow over the risers on reverse-sloped terraces.

8.13 Outlets for drainage types of terrace

The outlets should be checked to see whether they are adequately protected. Make sure the water flows through the outlets instead of going around them. Any breaks must be mended immediately.

8.14 Soil productivity

Deep ploughing, ripping or sub-soiling is needed to improve the structure of the soils on the cut part of the bench terraces. Green manuring, compost or sludge is needed in the initial period in order to increase soil fertility. Soil productivity should be maintained by means of proper crop rotation and the use of fertilizers.

8.15 Support to landless:

- i. The unit cost per ha of bench terracing is estimated at Rs 100,000 and the FIG-Landless members are required to contribute 15 percent. The project shall release 85% i.e. Rs 85,000 and the farmers will have to contribute 15% i.e. Rs 15,000.
- ii. The project's share for construction of bench terracing shall be released in three stages based on progress in work after FIG-Landless utilizes FIG support of RS 30,000 and preliminary land development activities have been undertaken as verified by field staff of FOCUS (TO/SaC).
- iii. On utilization of the funds for bench terracing, FIG-Landless may also request for support for water harvesting structures and irrigation structures. The unit cost for water harvesting structures and irrigation structures is estimated at Rs 75,000 per FIG-Landless and the project shall support 85% i.e. Rs 63,750 and the balance of Rs 11,250 i.e. 15% shall be contributed by FIG-Landless members.

8.16 Implementation arrangement:

- i. Field staff thereafter shall facilitate FIGs-Landless to prepare and submit a proposal of land for bench terracing with a request to provide project support for bench terracing. Out of the total unit cost of Rs 100,000 per ha, the project shall provide Rs 85,000 per ha i.e. 85% and the balance 15% shall be contribution from the members. The amount shall be released in three instalments to the bank account of FIGs-Landless.
- ii. First Instalment of Rs 25,000 per ha shall be released upon the approval of the proposals of FIGs-Landless by DMU, FOCUS. Second instalment of Rs 30,000 per ha will be released subject to submission of the utilization certificate for the first instalment released to the FIGs-Landless and verified by FOCUS officials. Third instalment of Rs 30,000 shall be released after submitting utilization certificate for the second instalment and full utilization of member contribution and verified by FOCUS officials. Thereafter within 30 days of release of third instalment, FOCUS officials will have to obtain a utilization certificate from the FIG-Landless for the amount released as third instalment and file a completion certificate for the entire bench terracing support with copies of measurement book.
- iii. The works carried out under this support to FIGs-Landless shall be monitored by SAC/VLWs with the supervision of experts from district LR, S&WC Department.
- iv. At the time of construction the benches, the Village Field Assistant should verify the size of the bench by randomly checking whether the benches have been across the contour as far as possible.
- v. The length and breadth of the benches will have to be measured by the Village Field Assistant for determining the volume of earth work.

- vi. Measurement is recorded in the measurement book to be maintained by the Village Field Assistant and it will be the basis for preparing utilization certificates.
- vii. Once the bench terraces have been constructed and completion certificate submitted, FIGs-Landless shall become eligible to submit proposals for construction of water harvesting structures/irrigation structures. The field staff shall assist the FIGs-Landless in preparation of cost estimates for these structures.
- viii. DMU, FOCUS shall facilitate FIGs-Landless to apply to the Revenue Department for issue of temporary patta after undertaking land development.
- ix. Maintenance of the terraces will be the responsibility of the members.

8.17 STANDARD SCHEDULE OF RATES FOR BENCH TERRACING UNDER FOCUS MIZORAM

Analysis of Rate for construction of Inward Slope Terraces:-

Construction of Inward Slope Terraces (30 - 40 %)(Moderately Sloping) = **Rs. 1,00,000.00**

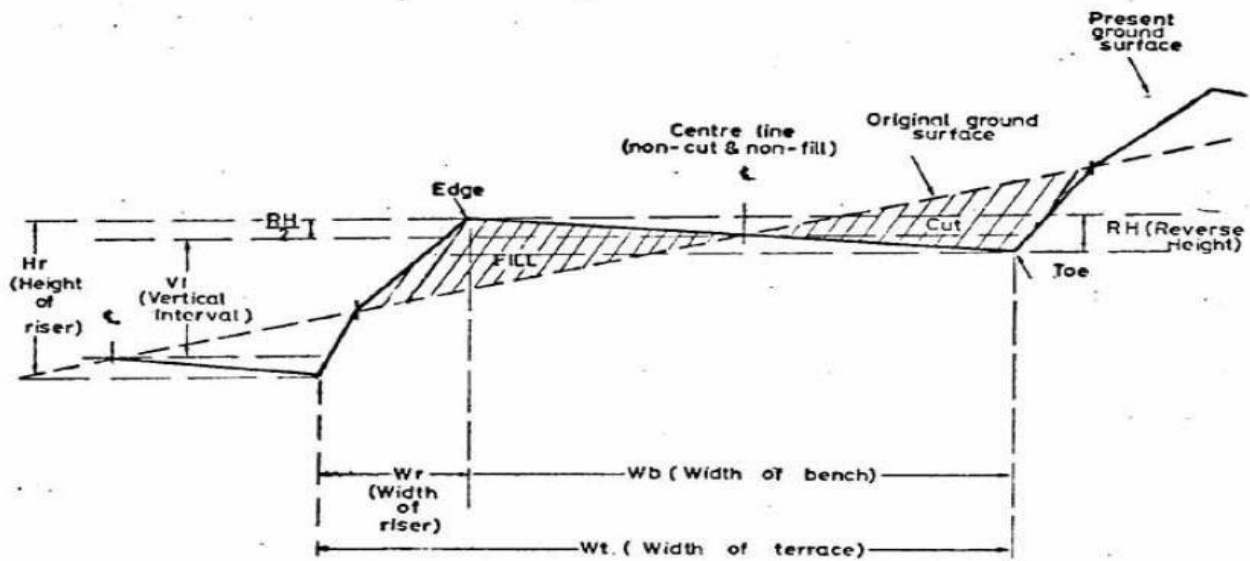
Analysis of Rate for construction of Inward Graded Board Base Terrace on 30 - 40 % sloping Land Per Ha. in Mizoram

'A' NOTES

1. Formula adopted are as per manual from FAO.
3. Width of bench (W_b) is taken as 1.50m.
4. Riser slope (U) is taken as 0.75m. (as per FAO guidelines for hand-made)
5. Riser/better slope of cut on 0.75:1 gradient adopted.
6. Assuming 100m x 100m area of land (1Ha).
7. Cross sections of the following is taken for –
 - i) Collector drain/Main drain-

Bottom width	-	0.300 m
Top width	-	0.500 m
Depth	-	0.300 m
Area (A_d)	-	0.120 m ²
8. Average slope percent (%) is taken as $(30+40)/2 = 35$ % slope
9. Man-days required for other items at 'C' are constant per hectare.
10. Earthwork items are based on Mizoram PWD Schedule of Rate 2019 cost Index

CROSS-SECTIONAL VIEW OF BENCH TERRACES



1. Vertical Interval (VI)	:		$VI = \frac{S \times Wb}{100 - S \times U}$ <p style="margin-left: 20px;">(S : Slope in % U : 1 or 0.75)</p>
2. Reverse Height (RH)	:		$RH = Wb \times 0.05$
3. Height of Riser (Hr)	:		$Hr = VI + RH$
4. Width of Riser (Wr)	:		$Wr = Hr \times U$
5. Width of Terrace (Wt)	:		$Wt = Wr + Wb$
6. Linear Length (L)	:		$L = \frac{43,560}{Wt} \text{ (per acre)}$ $L = \frac{10,000}{Wt} \text{ (per ha.)}$
7. Net Area of Benches (A)	:		$A = L \times Wb$
8. Percent of Benches (Pb)	:		$Pb(\%) = \frac{A}{43,560} \times 100 \text{ (per acre)}$ $Pb(\%) = \frac{A}{10,000} \times 100 \text{ (per ha.)}$
9. Cross Section of Terrace (C)	:		$C = \frac{Wb \times Hr}{8}$
10. Volume to be cut and filled (V)	:		$V = L \times C$

'B' Formula :

By calculation from the above formula, we get:

1. Vertical Interval (VI)	=	0.700 m
2. Reverse Height (RH)	=	0.750 m
3. Height of riser (Hr)	=	0.775 m
4. Width of riser (Wr)	=	0.580 m
5. Width of terrace (Wt)	=	2.080 m
6. Linear length (L)	=	4808 m
7. Net area of benches (A)	=	7212 m
8. Percent of benches (Pb)	=	72%
9. Cross section of terrace (C)	=	0.145 m ²
10. Volume to be cut and filled (V)	=	697 m ³

Drainage system:

- Collector drain:

$$\text{Length (L1)} = Nd(Nt(Wb+Hr))$$

where,

Nd = Number of vertical drain per hectare = 2 (both sides of the land)

Nt = Number of terraces = $100m/Wt = 48$ nos. (100m since 100m x 100m land)

Therefore, $L1 = 2(48(1.500+0.775)) = 218$ m

- Main drain : The main drain will be located at the end.

Therefore, Length (L2) = 100 m (since 100m x 100m land)

- Volume of earthwork for drainage system = $Ad (L1+L2)$
 $Vd = 0.120 (218+100)$
 $Vd = 38.16 \text{ m}^3$

'C' Cost of Items of Works per Hectare -

(Based on Mizoram PWD SOR,2019)

- | | | |
|--|------------------|------------------------|
| 1/2.03 Earthwork in excavation exclusive of compensation of earth in | | |
| a) ordinary soil - | | |
| i) Kassi work undressed involving an average horizontal throw upto 2m and an average vertical lift upto 0.50m including breaking of clods (for terracing) | | |
| - $(697 + 38.16)\text{m}^3 = 735.16 \text{ m}^3$ | | |
| @ Rs. 118.40/m ³ ----- | | = Rs. 87,042.94 |
| 2/2.18 Filling available excavated earth in trenches, plinth, sides of foundation etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering etc. - 38.16 m ³ | | |
| @ Rs. 129.50/m ³ ----- | | = Rs. 4,941.72 |
| 3/1.01 Clearing grass and removal of rubbish upto a distance of 50 meters outside the periphery of the area cleared – | | |
| By Manual means | | |
| | L.S | = Rs. 4,000.00 |
| | TOTAL (C) | = Rs. 95,985.00 |

'D' Other Items of work per Hectare

- Contour Survey and demarcation (10 man days)
 @ Rs. 420.00/day ----- = Rs. 4,200.00

GRAND TOTAL : (C+D) = Rs. 1,00,185.00

SAY : = Rs. 1,00,000.00

(Rupees One Lakh) only

* The project shall release Rs 85,000/- (85% of Rs 1,00,000.00 for supporting 1 Ha) and the balance Rs 15,000.00 (15% of Rs 1,00,000.00 for supporting 1 Ha) shall be the contribution of beneficiary.

- The amount for bench terracing proposed in AWPB of 2020- '21 is revised and a budget of INR 1.00 lakh per hectare is proposed since the rates as per PWD SOR, 2019 (which is the prevailing rates in Mizoram) are much higher as compared to that of 2017- '18. The budget of INR 1.00 lakh per hectare was also proposed in the AWPB 2018- '19 and was given No Objection Certificate from IFAD.

9.0 Water harvesting structures and other irrigation structures

Water is an important resource that is used in our daily lives. It is used in vitally important sectors of the economy, such as the agriculture sector. Farmers use water to grow crops. Not only is water used to grow crops, it is also used to process agricultural products before they can be sent to the marketplace. Even when they reach markets and are bought by consumers, water is still needed to transform raw food items into edible forms. Water is indisputably an essential resource used by everyone linked to the agriculture sector.

Water conservation is increasingly being encouraged in crucial sectors of the economy, such as the agriculture sector. This is fuelled by an increasing demand for water and growing concerns of water scarcity in the society. The United Nations even considers water availability to be a major issue for the 21st century.

A commonly asked question regarding water conservation is how do we conserve water? It is noteworthy that water can be conserved in many ways. One way to conserve water is through rainwater harvesting. Rainwater harvesting is simply the act of collecting rainwater during and/or after rainfalls. Once rainwater has been collected, it is treated and stored for re-use.

Rainwater harvesting has agricultural uses. It can be used for watering gardens in our homes and crop plants in agricultural fields. These reduce the reliance of garden owners and farmers on other sources of water supply, thus saving them money.

Also, we are in a climate change era where intense rainfall is expected. And it can damage agricultural land areas. Rainwater harvesting can be used to divert heavy rainfall from reaching agricultural lands, thereby protecting crop plants from getting damaged. One good property of rainwater is that it is a soft form of water and does not impact plants negatively. Unlike hard water, that adds calcium carbonate to crop plants, forming a coating on the roots/leaves. When such coatings are formed, it prevents plants from receiving the maximum amount of the water, minerals, fertilizers and pesticides that are supplied to them. It also prevents plants from receiving maximum sunlight, thereby slowing down photosynthesis.

Furthermore, the use of soft water from rainwater harvesting can help to reduce farmers' operating costs. This is because calcium carbonate from hard water normally piles up in pumps or sprinklers causing blockages. When such equipment is blocked, money is used to unblock their pathways. In contrast, such problems are not usually associated with the use of soft water in farming operations, thus reducing the cost to maintain crops.

Moreover, the use of hard water from water mains in farming operations causes scale formations on plants - due to the Calcium Carbonate contents of hard water. These formations promote the growth of bacteria that is capable of damaging crop plants. However, such scale formations are not linked with the use of soft water from rainwater in farming operations, making it safe for plants. Also, rainwater can be used as a source of drinking water for livestock. And it is suitable for livestock compared to chlorinated water. Furthermore, rainwater can be used to carry out domestic tasks in the farm such as cleaning machinery.

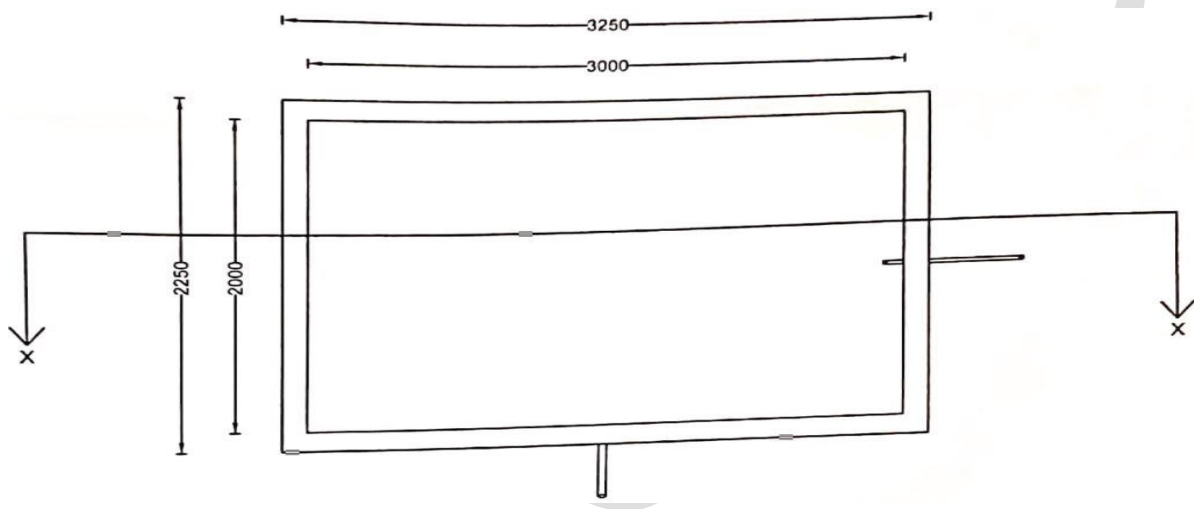
9.1 Implementation arrangement:

- i. The unit cost of water harvesting structures and other irrigation structures as per PIM is Rs.75,000/- per village. However, estimation shall be based on the site survey and type of structure required which will give the actual cost. As per recommendation of the Supervision Mission 2020 of IFAD, the unit cost can differ up to 20%. However, if the difference in cost estimation with the unit cost given in PIM i.e. Rs.75,000 is higher than 20%, NOC shall be obtained from IFAD.
- ii. Field staff in coordination with line departments thereafter shall facilitate FIGs-Landless to prepare and submit a proposal of land including cost estimation for water harvesting structure and other irrigation structures with a request to provide project support for the same. Out of the total unit cost, the project shall provide 85% of the cost and the balance 15% shall be contribution from the members. The amount shall be released in three instalments to the bank account of FIGs-Landless.
- iii. First Instalment i.e. 35% of the cost estimate shall be released upon the approval of the proposals of FIGs-Landless by DMU, FOCUS. Second instalment i.e. 35% will be released subject to submission of the utilization certificate for the first instalment released to the FIGs-Landless and verified by DMU-FOCUS. Third instalment i.e. 30% shall be released after submitting utilization certificate for the second instalment.

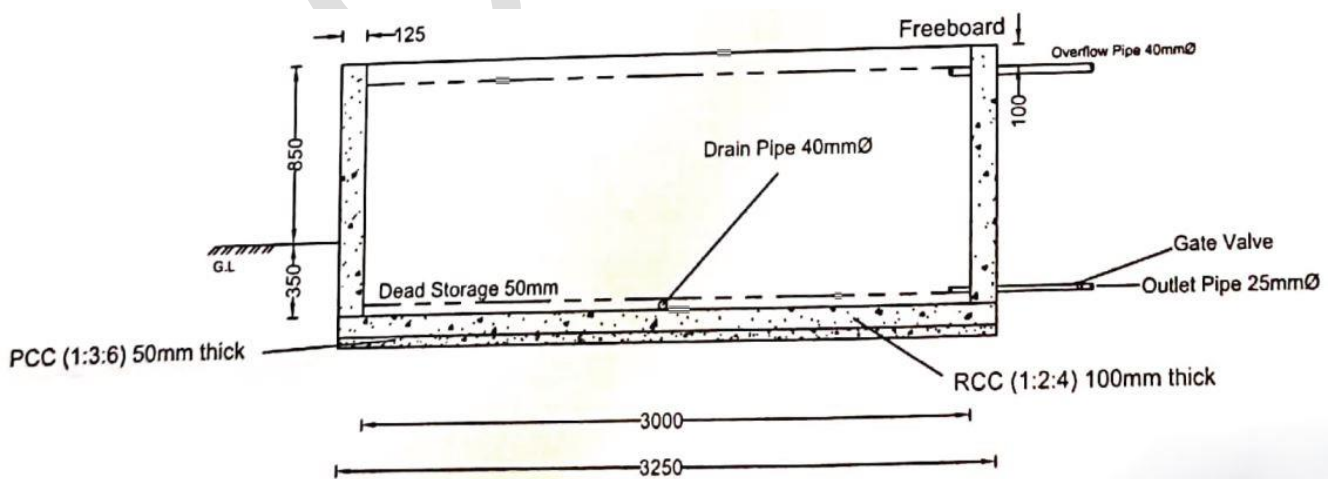
and full utilization of member contribution and verified by DMU-FOCUS. Thereafter within 30 days of release of third instalment, DMU-FOCUS will have to obtain a utilization certificate from the FIG-Landless for the amount released as third instalment and file a completion certificate for the water harvesting structure.

- iv. The works carried out under this support to FIGs-Landless shall be monitored by SAC/VLWs with the supervision of experts from district LR, S&WC Department.
- v. At the time of construction, the water harvesting structure, the Village Field Assistant should verify the size of the earthwork and structure by measurement.
- vi. Measurement is recorded in the measurement book to be maintained by the Village Field Assistant and it will be the basis for preparing utilization certificates.
- vii. Maintenance of the water harvesting structure will be the responsibility of the members.

9.2 Drawing and cost estimation of water harvesting structure



PLAN



SECTION AT X-X

Estimate on construction of water harvesting structure (Water Tank):										
Detail measurement, calculation of quantities and cost estimate										
Sl. No	Items No	Description	No	L	B	H	Qty	Unit	Rate/Unit	Amount (in Rs)
1	2.01	Surface dressing of ground including removing vegetation and inequalities not exceeding 15cm deep and disposal of rubbish, lead upto 50 m and lift upto 1.5m .								
		(a) All kinds of soil	1	5	5		25.00	sqm	14.40	360
2	2.03	Earthwork in excavation exclusive of compensation of earth in -								
		(a) Hard Soil	0.50	4.00	3.00	1.70	10.20	Cum	238.10	2428.62
3	2.08	Earthwork in excavation in foundation trenches etc. not exceeding 2 meters depth including dressing of bottom and sides of trenches and subsequent filling and compaction in 15cm layers as in column foundations, fence posts, etc. and disposal of all surplus soil as directed within a lead of 30 metres								
		(b) Hard soil (pick works)	1.00	3.25	2.25	0.50	3.66			
		Total					3.66	Cum	466.6	1707.76
4	4.03	Providing and laying in position cement concrete of specified grade excluding cost of centering and shuttering - All work upto plinth level:								
		Foundation	1.00	3.25	2.25	0.05	0.37	Cum	7350.60	2687.56
5	5.01	Providing and laying in position reinforced cement concrete excluding cost of centering and shuttering , finishing and reinforcement in -								
		(b) 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size)								
		Floor-	1.00	3.25	2.25	0.10	0.73			
		Wall(Long)	2.00	3.25	1.20	0.125	0.98			
	Wall(Short)	2.00	2.00	1.20	0.125	0.60				
	Total					2.31	cum	8633.00	19909.86	
6	5.18	Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete.								
		(a)Mild steel and Medium Tensile steel bars.								
		Provide 120 kg/cum as per item No -5/5.01		2.31	100.00		231.00			
	Total					231.00	Kg	78.40	18110.40	
7	5.10	Centering and shuttering including strutting, propping etc. and removal of form for all heights :								
		(b) Walls including attached pillars, butresses, string courses etc								
		Wall long	4.00	3.25	1.20		15.60			
		Wall short	4.00	2.00	1.20		9.60			
	Total					25.20	sqm	512.00	12902.40	
8	20.2	12mm cement plaster 1 : 4 (1 cement : 4 fine sand) finished with a floating coat of neat cement.								
		Floor-	1.00	3.00	2.00		6			
		Walls(Outer)	2.00	3.25	0.85		5.53			
			2.00	2.00	0.85		3.4			
		Walls (inside)	2.00	3.00	1.20		7.2			
			2.00	2.00	1.20		4.8			
	Top of walls	1.00	10.50	0.125		1.31				
	Total					28.24	sqm	345.30	9750.41	
9		Providing,fitting and laying Outlet pipe, drain pipe and over flow pipe								
		Overflow-40mm dia					6.00	Rm	289.10	1734.60
		Outlet-25mm dia					3.00	Rm	197.65	592.95
		Valve 25mm dia					1.00	No	923.00	923.00
		Bend 40mm dia					2.00	No	154.00	308.00
		Drain- 40mm dia					3.00	Rm	289.10	867.30
	End plug-40mm dia					1.00	No	74.00	74.00	
Sub Total										72356.85
Cost index for Serchhip District 3.73%										2698.91
Total										75055.76
Say										75000.00

(Rupees seventy five thousand only)

Note: Rate based on Mizoram PWD SOR 2019 Building

* The project shall release Rs 63,750.00/- (85% of Rs 75,000.00 for 1 unit) and the balance Rs 11,250.00 (15% of Rs 75,000.00 for 1 unit) shall be the contribution of beneficiary.

10.0 Seeds for other crops

10.1 Cauliflower and Papaya –

- 1) **Cauliflower** – Is an important winter vegetable throughout the country. However, production in Mizoram is very low in relation to demand. Most of the cauliflower in the state market is imported from other states. Lockdown and movement restriction due to Covid – 19 may affect availability within the state as duration for restrictions due to this crisis is unpredictable. Supply and planting of cauliflower under the project may help to ameliorate the scarcity of cauliflower within the state market. Providing seeds for cultivation to the landless farmers may help to generate good, short term initial income.
- 2) **Papaya** – Papayas grow in tropical climates with a wide variety of health benefits making them a popular fruit. The possible health benefits of consuming papaya include a reduced risk of heart disease, diabetes, cancer, aiding in digestion, improving blood glucose control in people with diabetes, lowering blood pressure, and improving wound healing. Supply of seedlings to landless farmers may generate a good source of sustainable income in the long term. Markets for papaya is also readily available and surplus produce can also be used as food for livestock.

10.2 Cost of cultivation

i) Cost of cultivation for papaya

Sl no	Items/Activity	Unit	Rate	Quantity	Amount (Rs)
1	2	3	4	5	6
A	Cost of crucial inputs				
	Cost of Papaya Seedlings	Household	Rs 40 per seedling	57	2,280.00
	Sub-Total of A				2,280.00
B	Cost of Field Operations				
	Pit Digging (Beneficiary contribution)	LS	Rs 30/pit	57	1,710.00
	Planting of seedlings/Pit filling (Beneficiary contribution)	LS	Rs 10/seedling	57	570.00
	Transport of seedlings	LS	220	-	220.00
	Sub-Total of B				2,500.00
	Sub-Total of A + B				4,780.00

Project Support = Rs 2,500.00
Beneficiary Contribution = Rs 2,280.00

ii) **Cost of cultivation of Cauliflower**

Sl no	Items/Activity	Unit	Rate	Quantity	Amount (Rs)
1	2	3	4	5	6
A	Cost of crucial inputs				
	Cauliflower	Household	Rs 31/gram	58 gm	1,798.00
	Slaked Lime	Household	Rs 10/kg	50 kg	500.00
Sub-Total of A					2,298.00
B	Cost of Field Operations				
	Land Preparation and application of slaked lime (Beneficiary contribution)	LS	Rs 500	-	500.00
	Planting of seedlings (Beneficiary contribution)	LS	Rs 200	-	500.00
	Transport of seedlings	LS	Rs 202		202.00
Sub-Total of B					1,202.00
Sub-Total of A + B					3,500.00

Project Support = Rs 2,500.00
 Beneficiary Contribution = Rs 1,000.00

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