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(Action Point: General Recommendations S. No. 4 at page 5)

भारतीय मृदा एवं जल संरक्षण संस्थान
IISWC

Assessment on Requirement of "Jalkunds" in Meghalaya State

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Background

The north-eastern region of India comprising eight states, viz. Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland, Tripura and Sikkim, has a total geographical area of 262,180 sq. km, which is nearly 8% of the total area of the country with more than 39.0 million population. The major constraints of the region are undulating topography, highly eroded and degraded soils and inaccessible terrain, land tenurial system, size of land holding and prevalence of shifting cultivation. Despite the constraints, the region is endowed with a bounty of water resources, accounting for about 40% of the total water resources in the country, i.e. about 60 million ha-m (Samuel and Satapathy, 2008). The average annual rainfall in Meghalaya is about 2450 mm with pre-monsoon rainfall (March-May) accounting for 25% and bulk of the rainfall (67%) occurs during June-Sept which constituted the monsoon season. Daily rainfall with a ten year return period ranges from 150 to 225 mm over most of the region and that over 500 mm can be expected once in a year (Sharma 1996). Despite a water surplus region, farmers suffer from extreme water scarcity during November to March (ICAR, 2016) due to poor management of water resources coupled with lack of suitable soil and water conservation measures (Saha et al., 2007). Excessive runoff is the major cause of water loss, but it also provides an opportunity of rainwater harvesting. Therefore, rainwater harvesting could be an important strategy for efficient and effective water management for sustainable livelihood in hills. *Jalkund* - a micro rainwater harvesting structure is found suitable for the farmers residing in the hill top for small scale agricultural activities (ICAR, 2016). The technology is simple and low cost and used for storing rainwater in the upper terrace condition. Large scale adoption of this technology and its judicious use can provide new and diverse livelihood options for the resource poor farmers of NE region. This policy paper is an attempt to assess the number of the *jalkunds* required, and its budgetary implications and potential benefits for the Meghalaya State.

Methodology for Assessment

1. There are two approaches in estimation of potential number of the *jalkunds*, namely (1) rainfed area approach and (2) number of the operational holders units.
2. In the Rainfed area approach, it can be assumed that a particular number of the numbers of the *jalkunds* are required to cover the certain percentage of the total rainfed area assuming each *jalkund* can irrigate 400 and 800 m^2 area under farmer's practice and with micro-irrigation, respectively. However, in this way, covering entire rainfed area seems practically infeasible and ecologically undesirable.
3. Therefore, number of operational landholders approach wherein it was assumed that at least one *jalkund* can be provided to each landholder as most of the farmers are having a sizable portion of their land as rainfed in the State.
4. District-wise numbers of the operational landholders were taken from Agriculture Census 2015-16, MoAFM, Govt. India.

Costing of *Jalkund*

The cost of the *Jalkund* is depend on the size (L x W x D) which can be decided from catchment-command-storage relationship. If there is sufficient runoff, then the Jalkund dimension is decided based on water requirement of the crops the farmers intended to do during rabi season and other income generating interventions like poultry, fishery, piggery, duckery etc. Otherwise the dimension of the Jalkund is decided based on limiting volume of runoff expected from the catchment irrespective of the area and crop water requirement. In the particular case, the dimension of 5 m x 4 m x 1.5 m have been found optimum for the region for a farmer having an average size of land holding and expecting enough runoff from the upper part of the land holding to the get filled the Jalkund. The cost estimation for one *jalkund* is given in table 1 with cost of materials required and no. of man-days generated which can be met out from different convergence of ongoing government schemes like MGNREGA.

Table 1: Estimation of *Jalkund* with cost of labour and materials				
S. No.	**Particular**	**Labour cost (Rs.)**	**Materials Cost (Rs.)**	**Total Amount (Rs)**
1	Earth work	5400		5400
2	Plastering with clay, cushioning with pine leaf etc, silpaulin lining and fixing in sides	2000		2000
3	Thatching to cover jalkhund for preventing evaporation loss	1050		1050
4	Silpaulin sheet (specification…GSM/micron)		7200	7200
5	Fencing (Cost of materials & Labour)	1500	1896	3396
6	Contingencies (5% of total cost)		954	954
Total		**9950**	**10050**	**20,000.00**
About 33 mandays of labour will be required for construction of one *Jalkund*				

Estimated Number of *Jalkunds* and Budget

Cost of *jalkund* pond was estimated at Rs. 20,000/- per unit and Rs. 30,000/- for *jalkund* pond with micro-irrigation system. Benefit: cost ratio was assumed as 1.8 and 2.0, respectively for *jalkund* pond with farmer's practice and *jalkund* pond with micro-irrigation, respectively.

Table 2: District-wise operational holdings and estimated budget

District	**Operational holdings/ No. of *jalkund* (000')**	**Potential area to be irrigated (ha)**		**Budget (Rs in Crores)**	
		With farmer's Practice (*jalkund*)	**With MI (*jalkund*+ Micro-irrigation)**	**With farmer's Practice (*jalkund*)**	**With MI (*jalkund*+ Micro-irrigation)**
East Garo hills	17.1	684	1368	34.3	51.4
East Jaintia hills	13.7	548	1096	27.3	41.0
East Khasi hills	43.4	1736	3472	86.7	130.1
North Garo hills	7.2	288	576	14.5	21.7
RiBhoi	27.9	1116	2232	55.7	83.6
South Garo hills	12.0	480	960	24.0	36.0
South West Garo hills	13.1	524	1048	26.1	39.2
South West Khasi hills	13.5	540	1080	27.1	40.6
West Garo hills	36.1	1444	2888	72.2	108.3
West Jaintia hills	15.9	636	1272	31.8	47.7
West Khasi hills	32.5	1300	2600	65.1	97.6
State	**232.4**	**9296**	**18592**	**464.8**	**697.2**

District wise estimated numbers of *jalkunds* are given in table 2. The estimated number of *jalkunds* are required is 232.4 thousand to cover the entire Meghalaya State. The highest number of *jalkunds* are to be constructed in East Khasi hills (43.4 thousands) followed by West Garo hills district (36.1thousands). For the entire State, total budgetary requirement is Rs 464.8 and 697.2 crores for farmer's practice and with micro-irrigation, respectively. Total potential area can be irrigated in the entire state with farmer's practice of irrigation and using micro-irrigation through *jalkunds* are about 9296 ha and 18592 ha respectively.

Economic Impact of the *Jalkund* in NE Region

Extant literature shows that *jalkund* is economically viable in NE India as evident from B:C ratios which varies from 1.42 to 4.33 for different crops with fishery, duckery and piggery (Saha*et al.*, 2007; KVK-Sikkim 2015; Bhakta *et al.*, 2018; Singh *et al.*, 2018; Singh and Athokpam, 2018; ICAR, 2016). Ngaachan (2005) also reported that adoption of the *jalkund* resulted in an increase of net profit to the extent of Rs. 3330 to 7450 per *jalkund* from different enterprises in the NE region. Keeping above coefficient in view, for the sake of simplicity, for assessing the potential impact of the intervention at the regional scale, it was assumed that the benefit: cost ratios for the *jalkund* are 1.8 and 2.0 for farmer's practice and with micro-irrigation, respectively.

Estimated Benefits of the *Jalkund*

A conservative estimate shows that the spread of jalkund technology in the entire Meghalaya State can yield economic benefits to the extent of Rs 697.2 and 1394.4 under the farmer's practice and with micro-irrigation, respectively in year (Table 3). However, if the jalkund is used for taking up a combination of the enterprises (high value crops along with piggery, fishery and duckery) the economic benefits would be much higher than aforesaid monetary estimates.

Table 3: Estimated Economic benefits of Jalkund in Meghalaya State

District	Jalkund pond + Farmers Method of Irrigation		Jalkund pond + Micro Irrigation	
	Estimated Cost (Rs in Crores)	Estimated Benefits (Rs in Crores)	Estimated Cost (Rs in Crores)	Estimated Benefits (Rs in Crores)
East Garo hills	34.3	61.7	51.4	102.9
East Jaintia hills	27.3	49.2	41.0	82.0
East Khasi hills	86.7	156.1	130.1	260.2
North Garo hills	14.5	26.1	21.7	43.4
RiBhoi	55.7	100.3	83.6	167.2
South Garo hills	24.0	43.2	36.0	72.0
South West Garo hills	26.1	47.0	39.2	78.4
South West Khasi hills	27.1	48.7	40.6	81.2
West Garo hills	72.2	130.0	108.3	216.6
West Jaintia hills	31.8	57.2	47.7	95.4
West Khasi hills	65.1	117.1	97.6	195.2
State	**464.8**	**836.6**	**697.2**	**1394.4**

Conclusion

For effective and efficient water management in Meghalaya State, *jalkund* is an economically viable and feasible technology, particularly for small and marginal farmers, if harvested water is used for cultivation of the high value crops such as vegetables coupled with fishery, duckery and piggery. A total number of 232.4 thousand *jalkunds* are needed for the Meghalaya State with an allocation of Rs. 464.8 and 697.2 crores budget for farmer's practice and with micro-irrigation, respectively. These estimated outlay and benefits can facilitate prioritization and allocation of scare financial resource for sustainable use of water resources in State, and thereby securing the livelihood of resource poor farmers of the state.

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Annexure-I

Construction Procedure

- The *Jalkund* dimension should be standard in size (5 m x 4 m x 1.5 m) and silpaulin size should be 9m x8 m taking into consideration extra length of 0.5 m in each side for proper fixing.
- The bed and sides of the *Jalkund* should be smoothened by removing rocks, stones or other projections, which may damage the lining material. The inner walls, including the bottom of the *Jalkund*, should be plastered with a mixture of clay and cow dung in the ratio of 5:1.
- Spraying of insecticide like endosulphon 35EC on the surface of the inner walls and the bottom, and application of aluminum phosphide (@ 1 tablet/live hole) around the *Jalkund* should be done before the lining process.
- After clay-plastering, about 3–5 cm thick cushioning should be done with locally and easily available dry pine leaf (@ 2–3 kg/sq. m) on the walls and bottom, to avoid any kind of damage to the lining material from any sharp or conical gravel, etc. .
- Laying down of silpaulin lined sheet of thickness not less than 250 GSM should be done after completion all above works in such a way that it touches the bottom and walls loosely and uniformly and stretches out to a width of about 0.5 cm all around the length and width of the *Jalkund*.
- A 0.3 x 0.3 m trench should be dug out all around the *Jalkund* and 0.3 m outer edge sheet should be buried in the soil for keeping the sheet in position.
- A drop pit should be constructed to divert the entire runoff before allowing to flow into the the *Jalkund*, to arrest sediments and any unwanted materials flowing through before entering to *jalkund*.
- *Jalkund* should be covered with thatch (5–8 cm thick) made of locally available bamboo and grass to reduce evaporation during off-season.

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