

Micro rain water harvesting structure for hills – *Jalkund*

Source: Mass media (Water management)

Rationale

Annual average rainfall of the region is 2450 mm accounting for 10% (42.0 Mha m) of the country's total water of 420 Mha m. In spite of its rich water resources base, the region has not progressed to the expected level.

It can till date utilize only less than 1% of water resource (0.88 Mha m of water). Remaining more than 41.0 Mha m water is lost annually due to its major portion being hilly. This also depletes the soil fertility and imbalance the ecology of the region.

The practice of rainwater harvesting in ponds and reusing the stored water for life saving irrigation of crops and also for domestic purpose is prevalent in India since ancient times. One can find efficient management of water in the region in traditional farming systems like 'Zabo system' of Nagaland and Bamboo drip irrigation of Meghalaya and rice + fish farming in *Apatani* valley of Arunachal Pradesh.

In spite of its high rainfall, there is acute shortage of even drinking water during dry season ie, Nov to April in the region. Due to lack of irrigation facilities, a second crop is not possible in uplands, as a result cropping intensity is very low (120%) in the region.

The problem is especially grim in hill tops.

A simple rain micro rain water harvesting structure- *Jalkund* has been developed and popularize by the ICAR Complex Umiam to solve the problem of water scarcity to a great extent.

***Jalkund* technology**

The Institute has developed the low cost, simple, polythene based micro rain water harvesting structure for hill top and it was demonstrated in the fields of 111 farmers in four NE states (71 units through Farmers Participating Action Research Programme (Ministry of Water Resources) and 40 units through NABARD).

The capacity of a *Jalkund* is 30,000 litres at Rs. 6055. The cost of per litre harvested water was computed at Rs. 0.067 per litre considering 3 years life span of lining material.

Each *Jalkund* can harvest approximately one and half times its original capacity considering replenishment of the pond by intermittent rains and consequent evaporation loss of about 10%. Hence, the total water harvested per annum through the applied research programme of ICAR Complex is almost 5 million litres (5,000 cubic metres) which otherwise goes as runoff and might create flood problems in the downstream areas.

The water harvested in 111 *Jalkunds* can irrigate 35-40 ha under high value crop through drip irrigation. These activities are likely to increase the additional income to around Rs. 3.77

lakhs at the regional level. Subsistent farmer investing in micro water harvesting structure like Jalkund and its recycling can increase productivity and diversify their homestead farming to growing remunerable crops and rearing cattle, pigs, poultry, etc.

From each Jalkund, the farmer can grow 250 tomato plants with 18,000 litres water and the remaining 12,000 litres can be used for rearing 3 piglets or 10 ducks and 100 fish or 50 poultry birds.

ICAR Research Complex for NEH Region, Umiam is implementing a pilot project on “Scaling up of Water Productivity in Agriculture for Livelihood through Training and Demonstration” since 2007. Under this programme, it is intended to impart training, upscale knowledge and upgrade skills of the farmers and trainers from the entire NEH Region. During 2007-09, a total of 37 farmers training were conducted in Meghalaya and other NEH states where about 1850 farmers were trained in various aspects of water management and sustainable farming practices.

***Jalkund* construction mechanism:**

- Excavation of the pit of the 4 x3 x 1 on selected site (preferably at hill top/uplands) before the onset of monsoon.
- The bed and sides of the *kund* should be levelled by removing rocks, stones or other projections, which otherwise might damage the lining material.
- The inner walls, including the bottom of the *kund*, to be properly smoothed by plastering with a mixture of clay and cow dung in the ratio of 5 : 1
- 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.
- This should be followed by laying down of 250 mm LDPE black agri-film or Silpauline sheet. The agri-film sheet should be laid down in the *kund* in such a way that it touches the bottom and walls loosely and uniformly, and stretches out to a width of about 50 cm all around the length and width of the *kund*. A 25 x 25 cm trench should be dug out all around the *kund* and 25 cm outer edge of agri-film may be buried in the soil, so that the film is tightly bound from all around. At the same time, side channels all along the periphery of the *kund*, helps to divert the surface run-off and drain out excess rainwater flow. This is to minimize siltation effect in the *kund* by allowing only direct precipitation. Silpaulin sheet 250 GSM can be also used for longer duration in place of LDPE black agri-film.
- *Jalkund* was covered with thatch (5-8cm thick) made of locally available bamboo and grass. Neem oil (10ml/sq.m.) is also advocated to reduce evaporation in off season.



***Jalkund* with silapaulin lining**



Silapaulin lined *Jalkund* filled with rain water

Benefits/advantages from *Jalkund*

It has been recommended to construct the *Jalkund* at high ridges of crop catchments areas so that water could be recycled through gravitational force without any extra energy application. About 44% area is under high and medium altitudinal condition. Hence, farmers residing at the hilltop are considered to be the beneficiaries of this technology.

Low preparation and maintenance cost

The cost/l-harvested water, which was calculated on the basis of aging, duration of lined agri-film/silpaulin total expenditure under different materials and capacity of *Jalkund*. Total cost of a unit of *Jalkund* of size 4m x 5m x 1.5m is Rs. 6,550/- approximately.

Capacity

Farmers have the option to go in for size and capacity of the *Jalkund* according to the water requirement for crops intended to be cultivated. Preparation cost is reflected accordingly. However, considering the seepage loss of water, the size was restricted from 6000 to 30,000 l with respective dimensions of 3 m x 2 m x 1 m, 3 m x 2 m x 1.5 m, 4 m x 3 m x 1 m, 4 m x 3 m x 1.5 m and 5 m x 4m x 1.5 m. The size of lining material of the corresponding dimension was 6 m X 4 m, 7 m x 6 m, 7 mx 6 m, 8 m x 7 m and 9 m x 8 m respectively.

Use of stored water

The water stored in *Jalkund* can be used for many purposes. The vital necessity of the stored water is for irrigating plants. It can also be used for rearing ducks and for domestic uses. The few below are a description of its uses:

Crop production

Farmers grow tomato, capsicum, cabbage, strawberry, cauliflower, carrot, medicinal plants (*Alpina galanga*, local name Kulanjan) all along the periphery of the *Jalkund* to increase farm income as a whole.

Livestock and fish production

The stored water in the *Jalkund* could partly be used for crop production and partly for livestock or fish production or integration of both livestock and fish. Use of stored water for the dual purpose of crop production and livestock/ fish production was a complementary system, where none of the enterprise was practised at the cost of the other as far as water use was concerned. Various options of farmers' choice were tested for diversification and economic use of stored water in the *Jalkund*. Farmers can opt for these farming systems according to resources available with them.

Pig-based activity: Per unit water requirement of *rabi* crop and piglet has been standardized, which envisaged that 30,000 l of stored water could support 200 tomato plants in 250 sq. m area and five piglets for 200 days during dry spell periods (November to April) of the year.

Poultry-based activity: Based on per unit water requirement, 30,000 of stored water can support 200 tomato plants in 250 sq. m area along with 50 poultry birds for 200 days during water-stress periods (November to April) of the year.

Fish and duck-based activity: The stored water in the *Jalkund* could be partly used for crop production and partly for integration of fish-cum-duck culture, where *Azolla* is used as feed for fish production. In duck–fish integration, the duck variety selected was the Indian runner, which was found to survive well in the mid-hill conditions. Excreta of duck reared in the *Jalkund* were also used as fish feed. The water was used for vegetable production during December to February, and fish and duck lived together in the *Jalkund* during the whole post-rainy season without affecting water supply to the vegetable crops. The study revealed that apart from meeting water requirement of *rabi* crops, 30,000 of water could also support 1000 fish seedling of one month age, 25 fish of five months age and two ducks. By doing so, the water quality of stored water not only improved, but also farm income had increased.

Field demonstration on *Jalkund* in participatory mode

The tangible benefits accrued from implementation of *Jalkund* in NEH Region is reflected as per following table 1 & 2.

Table 1. Tangible benefits accrued from implementation of *Jalkund* in NEH Region

Sl. No	State	District	No. of Jalkund constructed	Crops/activities Undertaken	Net return from/Jalkund (Rs)
1.	Meghalaya	East Khasi Hills	21	Tomato	3404
		West Khasi Hills	15	Strawberry	6650
		Ri-Bhoi	30	Piggery	3500
		Jaintia Hills	10	Duckery	3450
		West Garo Hills	5	Fishery	3520
2.	Manipur	Churachandpur	3	Capsicum	3350
		Imphal West	4	Cabbage	3300
		Chandael	3	Cauliflower	3400
3.	Tripura	West Tripura	10	Cabbage	3500
4.	Nagaland	Dimapur	5	Maize	3495
		Wokha	5	Maize	3200
	NEH Region		111		

Table 2. Implementation of *Jalkund* under different projects by Water Management Division, I.C.A.R. Research Complex for NEH Region, Umiam, Meghalaya

Project	Sponsors	No. of Jalkunds				Type of polythene
		Ri-bhoi	East khasi hills	Jainita Hills	West khasi* Hills	
FPARP	Ministry of water resources	25	21	10	15	LDPE
Rural innovative fund	NABARD	5				LDPE
SWPAL	Ministry of Agriculture	7	-	2	4	Silpaulin

* Five unit is also given to Tura at Garu Hills.

Jalkund at Umroi Madan (Farmers field)

A strawberry farmer of Umroi Madan village of Ribhoi District could earn more than Rs.70,000/- in a year using water from *Jalkund*



***Jalkund* filled with rain water**



Strawberry cultivation in Umroi Madan