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Evaluation of Affordable Micro-Irrigation Technologies (AMITS) For Enhanced Quality Mulberry Leaf Production

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Mulberry (*Morus alba* L.) leaf production is often limited by the amount of available soil moisture and it can be increased by providing timely irrigation. Experimental findings reveal that irrigation increased leaf yield of mulberry plants by about 68%. Further, mulberry can be grown throughout the year under Eastern Dry Zones (EDZ) of Karnataka conditions unlike in temperate region of Himalayas. Hence, increase in leaf yield and water productivity of mulberry is possible by improved methods of irrigation. The gap between water demand and supply is increasing year after year and declining in availability of ground water further aggravate the situation causing major threat to agriculture globally. In water scarce area, judicious use of water is essential to get good crop production with limited water supply and adoption of moisture conservation measures (Shankar and Shivakumar, 2000). Prolonged drought stricken atmosphere in Karnataka compelling the sericulturists in shrinking the mulberry cultivation and either preventing or reducing the silkworm rearing in summer seasons. The reasons for low availability of irrigation water are irregular and inadequate rainfall, short spell down pouring >50% annual rainfall in single or multiple days heavy drowning and inadequate ground water are charge for bore wells leaving the recurrence of drought condition for prolonged period.

Besides, the practices of irrigation were flood irrigation and channel irrigation. These irrigation methods involve manpower for making ridges and furrows and there is wastage of water being flown openly thus increasing cost of agricultural production and productivity. Later drip irrigation (surface irrigation) was introduced. The advantages of drip irrigation are enormous. It reduces time as well as labour input, economizes the electricity and fuel saving as Tractor is used for field leveling, channeling reducing soil erosion and electricity for irrigation purposes. Small quantity of available water may be applied to a large area plant wise through drip irrigation systems reducing water losses of about 70-80% (Pankaj Kumar and Rathur, 2015).Fertilizer and nutrient loss is minimized and moisture within the root zone can be maintained at field level which will also minimize weed growth. Fertigation can easily be included with minimal waste of fertilizers, chemigation (application of pesticides) to prevent soil born diseases, foliage remains dry, reducing the risk of disease.

Flood irrigation as well as drip irrigation technologies too either directly or indirectly dependents on the availability of ground water. As described above due to insufficient and untimely rain fall failed to recharge the ground water table causing acute shortage for drip as well as flood irrigation. This situation is compelling sericultural farming community to shrink the mulberry acreage, withdrawing silkworm rearing crops during dry spell, uprooting the mulberry in desperation or switchover to other crop sacrificing mulberry sericulture. Under the situation alternate methods of economic usage of available water resource for continuing the sericulture has become imperative. Affordable Micro Irrigation Technologies (AMITs) in different areas have come into practice and the State Govt. of Karnataka also supporting the farming community by supplying the drip irrigation accessories in subsidized schemes. However, when mulberry requires 1.5 to 2.5 lit of water per plant irrigation with the existing quantity of bore well water providing the saturated irrigation for 5,555 plants/ acre a difficult task. Further, due to insufficient irrigation, farmers are not able to harvest required quantity of quality leaf during drought stricken conditions leading to silkworm crop failures and some of the farmers in Karnataka are adopting tree mulberry plantation in wider spicing such as 5'x5'; 6'x6'; 8'x3'; 8'x5' & 10'x10' convenient for mechanized cultivation avoiding drudgery of manpower through AMITs by providing plant wise manure, fertilizer & water and succeeding uniform quality of leaf with enhanced quality of cocoon.

Fig. 1: Farmer's garden in Karnataka imparting AMIT through the installation of Drum kit

Further, the sericultural farming community who are possessing with minimum water or with no water were backed with the support of **"drum kit"** technology a cost effective, eco-friendly and novel method of AMIT popularized by the Regional Sericultural Research Station, CSRTI, Mysore, Central Silk Board, Chamarajanagar has become a bless in disguise and generated a ray of hope among the farming community even to adopt sericulture under extreme drought stricken environment (Srikantaswamy and Bindroo, 2014). The technology has been proved as affordable, water, labour and energy saving cost effective devise for sustainable sericulture development. **Drum kit** is a very simple and novel method of drip irrigation technology by which a water drum of 2000 lit capacity is fitted at a height of 8-10 feet with a supportive flat farm structured by using a low cost stones, waste bricks, cemented rings or with any kind of rejected GI pipes (Fig. 2) by incurring minimum expenditure of Rs. 25,000/- per acre by procuring water drum, drips & laterals and manage a mulberry garden planted in wider spacing and adopt silkworm rearing by brushing 250-300 DFLs per acre. Under extreme conditions of not having any kind of water resource, by purchasing tanker water during acute drought spell if adopted can provide gainful income to the farmer (Table 1).

Table 1: Cost Benefit scenario of AMITs if adopted in sericulture**.**

1	Frequency of Irrigation/ crop (15 times/ crop (i.e. 3-4 days interval in 70 days of crop duration)	15 times/crop
2	Water requirement/ irrigation/ acre (@ 2000 lit/ irrigation i.e. 30,000 lit/ crop i.e. 6 tankers/ crop (@ of 5000 lit/ tank).	30,000 lit
3	Cost of Irrigation (Tanker water costs Rs. 500/-x 6 tankers = Rs. 3,000 /-water)	Rs. 3000/-
4	Quantity of DFLs to be brushed/ acre	250 DFLs
5	Cocoon Production out of 250 DFLs (Average yield of 150kg (@ 60kg/100DFLsof cocoon/crop)	150 kg/ac/cr
6	Production value of cocoons (Avg. cost Rs. 300/kgx150kg=Rs.45,000/-+Rs.7,500/-(DOS insentive @Rs 50/- per kg)	Rs. 52,500/-
7	Cost of production of cocoons (Cost of production= Cost of water+other expenditures @ 30% per crop)	Rs. 15,750/-
8	Net Benefit of Cocoon production (Net Benefit Rs. 20,000 minimum)	Rs. 36,750/-
9	Cost benefit ratio of cocoon production under drought stricken conditions	**1 : 7**

Fig.2: Drum Kits in different forms established on various types of low cost platforms

Based on the above technology AMITs of different kinds in the form of Drum Kits using low cost methods were installed at RSRS, CSB, Kodathi, Bangalore and studied their impact on the production of enhanced quality mulberry leaf production under varied geometries. The study was undertaken in different existing (>3 years old) mulberry plots planted in varied geometries *i.e*. paired row/ Indo Japanese spacing (IJS) with [(3'+5')2'],wider spacing in tree habitat such as 8'x3', 8'x5' & 10'x10' applying recommended doses of NPK (@350:140:140kg/ha/yr) supplementing with 20MT FYM/ha/yr under partial irrigation systems through AMITs (Dandin *et al,* 2003). It was observed that the plant growth and quality parameters are superior in wider spacing plots compared to traditional spacing plot (IJ spacing). Further, it was observed that superior and enhanced quality and quantity of mulberry leaf was produced in wider spacing (Table 2, 3 & 4, Fig. 3 & 4). Irrespective of plant populations under different geometries mulberry plant growth was uniform, stable with improved quality and enhanced leaf yield was observed. Further, it has been proved that though there was significant variation in plant population per acre area but leaf yield and quality was proved to be uniform because of profuse deep root system in tree habitat with proper aeration and ventilation under wider spacing being uniform application of plant wise manure, fertilizer avoiding wastage with required irrigation might be the reason.

Fig. 3: AMITs in various form installed at RSRS, Kodathi for uniform quality leaf production

Table 2: Growth variation of V1 tree mulberry as influenced by AMITs in varied geometries

Growth parameters	AMITs in varied geometries of tree mulberry			
	Paired row [(3'+5') 2']	Wider (8'x3')	Wider (8'x5')	Wider (10'x10')
Plant height (cm)	186.75	218.35	225.15	231.05
No. of branches	11.0	18.0	22.0	26.0
No of leaves	285.5	455.5	556.8	658.0
Intermodal distance (cm)	6.15	5.58	5.21	5.15
Leaf area (cm^2)	211.6	227.5	231.8	230.5

Table 3: Leaf quality of V1 tree mulberry as influenced by AMITs in varied spacing

Parameters	AMITs in varied geometries of tree spacing's			
	Paired row [(3'+5') 2']	Wider (8'x3')	Wider (8'x5')	Wider (10'x10')
Leaf moisture (%)	76.10	77.40	78.05	77.20
Chawki (tender) leaf moisture (%)	78.45	79.05	80.45	79.55
Medium & mature leaf moisture (%)	72.25	74.28	75.05	74.85
Leaf moisture holding capacity (%)	86.9	85.3	86.45	85.15

Table 4: Leaf yield of V1 tree mulberry as influenced by AMITs in varied geometries

Parameters	AMITs in varied geometries of tree spacing's			
	Paired row Spacing [(3'+5') 2']	Wider Spacing	Wider Spacing	Wider Spacing (10'x10')

		(8'x3')	(8'x5')	
Aerial biomass (kg/plant)	1.230	4.395	5.855	5.955
Leaf : shoot ratio (%)	52.59	62.51	63.54	59.55
Leaf yield (gm/plant)	0.738	2.637	3.513	3.573
Leaf yield (MT/ ha/yr)	**20.497.95** (5,555)*	**23.930.78** (1815)*	**19,128.29** (1089) *	**7,789.14** (436)*

*Figures in the parenthesis indicate the no. of plants/acre.

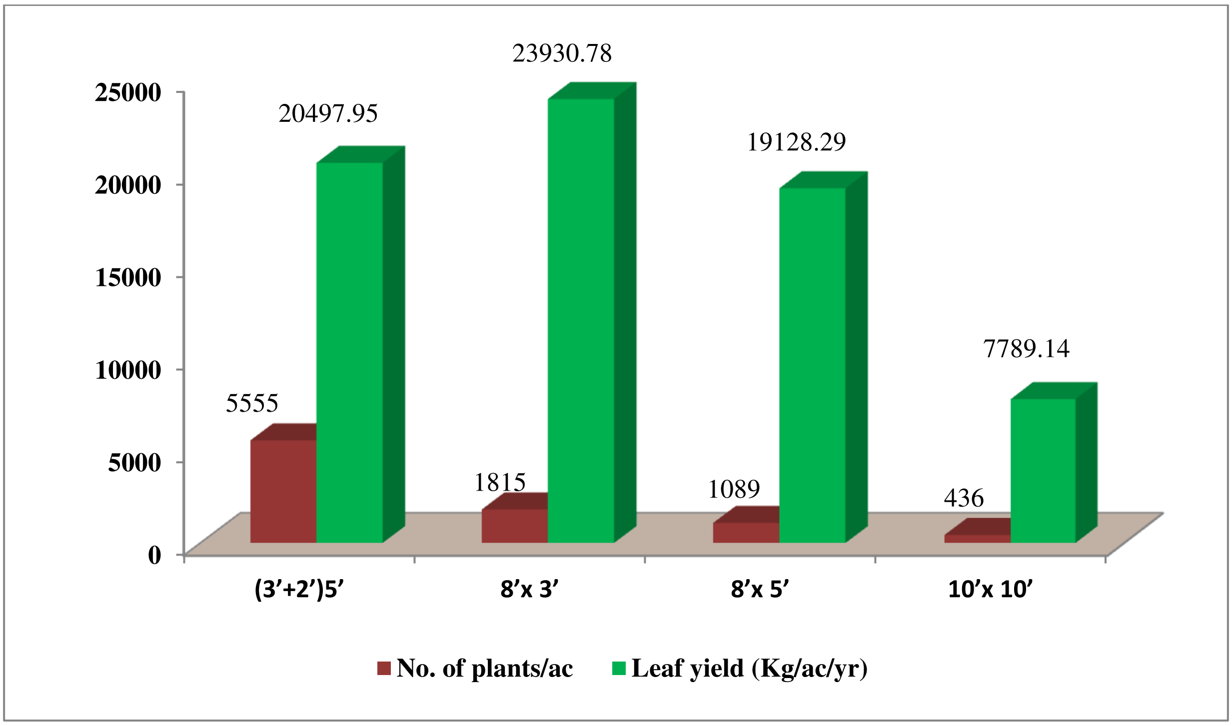

Fig.4: Leaf yield of V1 mulberry under varied no of plants in different geometries.

Even under the circumstances, if a farmers doesn't have bore well and water resource instead of not taking up silkworm crops during summer seasons even by purchasing tanker water and giving life-saving irrigations, sericulturists can raise profitable cocoon crops instead of sacrificing silkworm rearing in summer loosing nominal economic gain in summer too (Table 4).

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REFERENCES

Dandin, S.B., Jayaswal, J. and Giridhar, K. 2003. Handbook of Sericulture Technologies (Recommended for South Indian States). Pp. 259. Published by Central Silk Board, CSB Complex, BTM Layout, Madivala, Bangalore, Karnataka.

Pankaj Kumar and Rathor, R. S. 2015. Sprinkler irrigation brings cheer tofarmers. Indian Horticulture. March-April. Pp. 31.

Srikantaswamy, K. and Bindroo, B. B. 2014. AMIT- A novel technique for reviving sericulture in drought stricken Chamarajanagar district. *Indian Silk.*, June-August. Vol. (53 old) no. 2-4. Pp.20-21

Shankar, M. A. and Shivakumar, H. R. 2000. Drip and Fertigation to the mulberry. *Technical*

Bulletin. Dry Land Agriculture Project & Department of Sericulture, University of Agricultural Science, GKVK, Bangalore, Karnataka, India. Pp. 1-63.