

Dapog

Paddy seedling raising method

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Paddy is an important food of the tribal people of Valsad district of Gujarat. Traditionally farmers burn cowdung cake and biomass on selected land for raising seedlings known as Aadar. Burning damages soil health and decreases its productive capacity by destroying the humus (organic matter) and soil structure vital to good production. Krishi Vigyan Kendra initiated a systematic and comprehensive effort to improve soil health and profitability of paddy cultivation through Dapog method of raising seedlings, developed in Philippines, in which more healthy seedlings are raised on surface, like plastic sheets, in a small area of 376 m²/ha (0.04 ha.) as against 1207 m²/ha (0.12 ha.) for a traditional Aadar flat bed nursery so they can be easily uprooted and transplanted at a young age of 14 to 17 days. Transplanting of young healthy seedlings raised with dapog, recorded maximum number of tiller per plant and yield of paddy. Dapog method reduced 70% requirement of seed and 26.13% cost of nursery without deterioration in soil fertility.

Keywords: Biomass, Dapog, Nutrients, Paddy seedlings, Profitability, Soil health

PADDY is the staple crop of India, having 44.6 million ha area under cultivation. Valsad is one of the major paddy growing districts of Gujarat having area of 810.87("00") ha with 2189.15 ("00") MT of total production (2016-17). Paddy is important food of the tribal people of Valsad district. The soil of the area is characterized by medium black, shallow soil with steep slopes which is poor in fertility.

Traditionally, farmers of Valsad district are raising paddy seedlings with their traditional method known as *Aadar*. They makes layer of leaves, twigs, branches of plant, agricultural waste and cow dung cake on selected area for nursery and burns the biomass. After *Aadar* farmers makes flat beds and sow seeds. A farmer says that *Aadar* practices cuts down on soil diseases, kills weed seeds and addition of ash loosens the soil thereby easy uprooting of seedlings for transplanting.

According to the Indian Ministry of New and Renewable Energy (MNRE), India generates on an average 92 million tonnes of crop residue burned each year, increase the soil temperature more than 100°C in the upper 5 cm, with a concomitant

partial reduction of the bacterial population eroding amount of organic matter and loss of soil nutrients. Quantity of lost soil nutrients replenished through costly fertilizers increase cost of cultivation. Besides decline in soil health is an



Paddy seedlings raising with traditional method "Aadar-flat bed"



Raising of seedlings in dapog method

important issue for sustaining crop productivity. Among the several causes, critical low soil organic matter status is predominant for decline in soil health and consequent fall in crop productivity.

Traditionally, farmers make a ½ to 1 feet high layer of leaves, twigs, branches of plant, agricultural waste and cowdung cake on selected 0.12 ha (13,007 sq. ft) area and burn all the biomass. After *Aadar* practice they make flat bed and sow seeds @ 35 kg/ha. Weak and yellow seedlings with undeveloped roots are ready to transplant in 25 to 30 days, which are severely damaged during heavy rain. This method is costly, laborious and deteriorates soil health.

To stop deterioration of soil health and make paddy cultivation more profitable, Krishi Vigyan Kendra –

Valsad, demonstrated and assessed a dapog method of raising paddy seedlings during *kharif* 2017 and *kharif* 2018 in Asma and Ozar villages. Dapog method was developed in Philippines, in which seedlings are raised on surface, like banana leaves or plastic sheets without disturbance of soil. On plastic sheets, 92-100 beds of size 1 m wide and 5 m long, were made on raised surface and boundaries were provided with frames with the help of waste bamboo or bricks or stones. Each frame was filled with a mixture of 70% soil, 20% FYM, 10% ash and 100 g urea and SSP. About 36 to 48 hour pre-germinated paddy seed (Jaya variety) at the rate of 20 kg/ha was uniformly spread. The bed was mulched with paddy straw net to protect from bird damage.

Major advantages of Dapog nursery vs Traditional *Aadar* flat bed nursery

- In traditional *aadar* flat bed nursery seedlings are ready for transplanting in 22 to 25 days; however in dapog seedlings are ready within 14 to 17 days. It saves almost half of the time in seedling raising.
- Early stage transplanting of paddy seedlings raised in dapog nursery promotes early maximum tiller hence increased grain yield.
- The seedlings raised by this method are, very healthy, tall, with bigger seedling biomass, longer leaf blades and roots than seedlings grown in traditional *aadar* flat bed nursery.

Table 1. Traditional *Aadar* flat bed nursery vs Dapog nursery for raising of paddy seedlings

Major observation of trial	Traditional <i>Aadar</i> flat bed nursery	Dapog nursery
Seedlings ready for transplanting (average days)	22.2	15.6
Average number of seedlings transplanted per hill	4.5	2.1
Average number of seedlings per square feet	107.6	164.8
Average area of nursery required for transplanting of 1 ha	0.12	0.04
Average seed rate (kg/ha)	35.2	20.7

Table 2. Impact of paddy seedling raising methods on yield and yield attributes of paddy

Yield and yield parameters	Traditional <i>Aadar</i> flat bed nursery		Dapog nursery	
	<i>Kharif</i> 2017	<i>Kharif</i> 2018	<i>Kharif</i> 2017	<i>Kharif</i> 2018
Average number of tillers per plant	9.7	9.4	11.2	11.8
Grain yield (kg/ha)	3364	3247	3645	3572
Straw yield (kg/ha)	1804	1756	1795	1670
Straw bundle yield (kg/ha)	8995	8742	9020	8857
(1 bundle of 200-250 g straw)				
Increase in grain yield (%)	<i>Kharif</i> 2017		7.71	
	<i>Kharif</i> 2018		9.10	



Growth of paddy seedlings raised in dapog nursery vs Traditional *aadar* nursery flat bed

Table 3. Impact on cost of paddy seedling raising nurseries

Traditional <i>Aadar</i> flat bed nursery			Dapog method		
Operation for cultivation	Cost (₹/ha)		Operation for cultivation	Cost (₹/ha)	
	Kharif 2017	Kharif 2018		Kharif 2017	Kharif 2018
Soil preparation with tractor and rotary	1750	1830	Cost of material (Bamboo or bricks) required for making frame	900	900
Cost of seed @ average 35.7 kg/ha (Price @ 30 ₹/kg)	1056	1056	Cost of seed @ average 20.7 (price @ 30 ₹/kg)	600	600
Cost of farm waste and cow dung (Price @ 1 ₹/kg)	500	500	Cost of plastic bag/ plastic sheet	370	421
Cost of urea for fertilizer application	54	62	Cost of fertiliser (Compost, Urea and SSP)	1275	1380
Labour cost for collection and burning of farm waste and cowdung	2750	2810	Cost of straw bundel (Price @ 1.5 ₹/bundle)	276	276
Labour cost of sowing	1050	1050	Labour cost of filling frames and sowing	1425	1470
Labour cost of fertilizer application	240	240	Labour cost of of fertilizer application	825	825
Labour cost of uprooting of seedlings	1630	1670	Labour cost of uprooting of seedlings for transplanting	1425	1500
Total cost of traditional <i>aadar</i> flat bed nursery (₹/ha)	9030	9218	Total cost of Dapog nursery (₹/ha)	7096	7372
Average cost of traditional <i>aadar</i> flat bed nursery (₹/ha)	9124		Average cost of Dapog nursery (₹/ha)	7234	
Reduction in cost of nursery (%)				26.13	
Reduction in cost and requirement of seed (%)				70.0	

*Labour wages @ 200 ₹/day

- Healthy seedlings with more biomass results in transplanting of 2 to 3 seedling per hill, reduced 70% seed requirement in dapog method
- Valsad is situated in heavy rainfall area where, lesser seedling damage (during heavy rain) was noted in dapog nursery due to small nursery area and can be easily shifted.
- The dapog nursery does not require land preparation as it is established near the homestead in a small area so, it could save 25 to 26% in cost compared to traditional *aadar* flat bed nursery.

Growth and yield parameters

With the Dapog method, paddy seedlings can be transplanted within 14 to 17 DAS (days after sowing) however, in traditional *aadar* flat bed nursery transplanting is delayed, which reduces nitrogen content in the seedlings. The delay also reduced maximum tiller number, and extended crop duration with delayed maximum tillering, flowering and maturity. Crop lodging during heavy rains was minimum compared to traditional *aadar* flat bed nursery raised plot. Grain yield consistently increased up to 7.71 to 9.10% with younger seedlings transplanting.

Cost of paddy seedling nursery

The seed requirement and its cost for dapog nursery is reduced up to 70% i.e 20 kg/ha compared with 35 kg/ha for the traditional *aadar* flat bed nursery. The dapog nursery does

Table 4. Effect of burning of biomass on soil health of paddy seedling nursery areas

Chemical properties	Kharif 2017			Kharif 2018		
	Initial	After uprooting of seedlings		Initial	After uprooting of seedlings	
		Adar flat bed nursery	Dapog nursery		Adar flat bed nursery	Dapog nursery
EC (dS/m)	0.17	0.19	0.15	0.24	0.27	0.20
pH (1:2.5 at 25°C)	7.21	7.28	7.20	7.25	7.30	7.25
Organic carbon (%)	0.44	0.28	0.45	0.40	0.25	0.41
Available phosphorus (kg/ha)	28.00	19.00	27.00	30.00	25.30	30.10
Available potash (kg/ha)	358.00	423.00	358.00	364.00	417.00	362.00
Available sulphur (kg/ha)	8.47	6.48	8.45	8.52	6.37	8.50

Table 5. Impact on economic of parameters of paddy cultivation

Economic parameters	Traditional <i>Aadar</i> flat bed nursery		Dapog nursery	
	Kharif 2017	Kharif 2018	Kharif 2017	Kharif 2018
Income from grain (₹/ha) (Selling @ 13 ₹/kg)	43732.0	42211.0	47385.0	46436.0
Income from straw (₹/ha) (Selling @ 1.5 ₹/Bundle)	13492.5	13113.0	13530.0	13285.5
Gross income (₹/ha)	57224.5	55324.0	60915.0	59721.5
Gross cost of cultivation (₹/ha)	34497.0	35628.3	32825.0	33972.1
Net profit (₹/ha)	22727.5	19695.7	28090.0	25749.4
Increase in net profit (%)	Kharif 2017		19.09	
	Kharif 2018		23.51	
BCR	1.66	1.55	1.86	1.76

not require tractor ploughing as it is established near the homestead in a small area of 0.04 ha as against 0.12 ha for a traditional *aadar* flat bed nursery so inputs and labour cost is also reduced. The overall cost for the dapog nursery is reduced 26.13% for 1 ha of transplanted paddy.

Impact on soil health

For making of traditional *aadar* flat bed, nursery farmers burn biomass like twigs, branches of plants, crop residues and cowdung cake, which heats the soil above 100°C reducing the beneficial bacterial population and slows down the rate of mineralization of nutrients. *Aadar* practice also deteriorates the amount of organic matter and available soil nutrients present in soil and also responsible for soil structural degradation. Thus, *Aadar* practice, adversely affects the soil fertility and crop productivity. However, in dapog method of raising

paddy seedling, soil is not disturbed. Data of both year (Table 4) shows sustainability in soil health in dapog nursery areas.

Economics

Collection and burning of biomass for land preparation of big nursery area requires more labour and resources, increasing cost of nursery. Small area of dapog nursery, with low seed rate reduces the cost up to 26.13% than traditional *aadar* flat bed.

Transplanting younger healthy seedlings raised in dapog nursery, improves number of tillers, flowering result in 7 to 9% more grain yield of paddy, simultaneously increase net profit up to 19.09 to 23.51% against traditional *aadar* flat bed nursery. Highest BCR 1.86 (*Kharif* 2017) and 1.76 (*Kharif* 2018) were recorded with dapog nursery compared to traditional *aadar* flat bed nursery BCR 1.66 (*Kharif* 2017) and 1.55

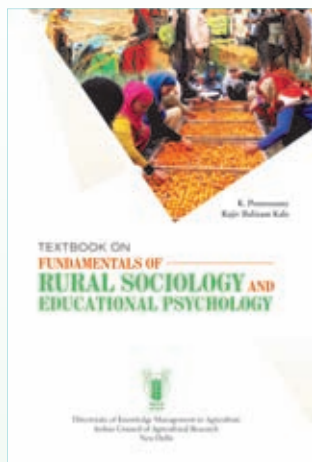
(*Kharif* 2018).

SUMMARY

Field assessment trials were conducted in Valsad district during *kharif* 2017 and *kharif* 2018 revealed that healthy paddy seedlings of paddy can be easily raised in small area near homestead within 14 to 17 DAS with low cost dapog nursery. Dapog method safeguards against deterioration of soil health and air pollution created by open burning of crop material and cow dung cake on field for land preparation to make traditional *aadar* flat bed nursery. Dapog method of raising paddy seedling has a potential to sustain soil health and improve productivity and profitability of paddy crop cultivation.

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TECHNICAL SPECIFICATIONS

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