

Water chestnut-rice cropping system - a strategy to enhance productivity of waterlogged area

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ABSTRACT

Productivity of rice in waterlogged area/deepwater area is very low due to submergence and at times prevailing water level of 1.5 to 2.0 m. In order to increase the *economic return from these areas in wet season water chestnut along with fish was tried and high yielding rice varieties were grown during dry season in farmers' field in Jaleswar area of Balasore district, Orissa. Black gram was grown in summer utilizing residual moisture of dry season crop. Three years experimentation in farmers' field indicated that the net benefit per hectare was increased from Rs.22,300 to Rs.42,050 when water chestnut was grown in wet season followed by rice in dry season. When fish component was added with chestnut the net return was increased to Rs1, 33,750. It is recommended that in deepwater/waterlogged area water chestnut may be grown with fish in wet season and rice in dry season. Black gram can be taken after dry season whenever moisture was available.*

Key words: rice, cropping system, strategy, water chestnut, fish, black gram

Though there has been comprehensive rate of growth in the rice production in the non traditional rice growing areas in India, the growth rate has been comparatively slow in the traditional rice growing areas of eastern India where 62% of the total rice lands are located. This is because of severe waterlogging in rainy season due to poor drainage system. The saucer shaped land forms, high rainfall and poor outfall conditions create severe water congestion and the area remains submerged for almost one to two months under water depth varying from 70 to 150 cm. Out of 8.5 million ha of waterlogged land, more than 2.5 million ha belongs to this type. In order to address the problem, a study was undertaken to introduce a water chestnut based cropping system at farmers' level.

The trial was undertaken in the village Panchughanta of Jaleswar block in Balasore district of Orissa. Water chestnut in wet season and paddy in dry season were evaluated in farmers' field. Fish was also grown as an additional source of income along with water chestnut during wet season. The experimental plot size of each farmer was 0.15ha (1500sq.m). The soil of the experimental fields was sandy loam in texture having pH 5.3-5.8, organic carbon 0.43-0.55%, total nitrogen 0.055-0.069%, available phosphorous 14.4-

16.6kg ha⁻¹ and available potassium 107.8-116.9 kg ha⁻¹. The relative contribution of water chestnut with integrated fish culture to grain yield in dry season and production economics of complete system was compared with that of traditional rice-rice system. Four cropping systems viz. rice - rice, water chestnut + rice, water chestnut and fish + rice and water chestnut and fish + rice + black gram were tried in the farmer's field.

An area of 1500 sq.m was considered as one replication. In total there were 12 plots of 1500sq.m each. The water level in each plot varied from 50cm in June end to 150cm in October that reduced to 20cm in December and virtually there was no water during January, there by facilitating the growing of dry season rice. Each system was tried in 3 farmer's field. During wet season rice cv. Kedargouri, water chestnut variety Haladipada Red and the fish species *Clarius batrachus* was tested whereas, during dry season rice cv. Samrat was cultivated. During summer black gram variety T-9 was tested in the field.

Analysis of the yield of different crops in different systems indicated that in rice-rice cropping system the three years average yield in wet season

Table 1. Grain yield in different cropping systems in waterlogged situation in Balasore district, Orissa

Cropping system	2005			2006			2007			Average		
	Wet season	Dry season	Summer season	Wet season	Dry season	Summer season	Wet season	Dry season	Summer season	Wet season	Dry season	Summer season
Rice + Rice	0.91	2.7		0.90	3.5		0.89	3.4		0.9	3.2	
Water chestnut + Rice	17.0	4.0		16.0	4.2		12.0	4.4		15.0	4.2	
Water chestnut and fish + Rice	17.0	4.0		16.0	4.2		12	4.4		15.0	4.2	
	and 2.3			and 2.4			and 1.9			and 2.2		
Water chestnut and fish + Rice + Black gram	12.0	3.9	0.9	15.0	4.4	1.0	13.0	4.0	0.8	15.0	4.1	0.9
	and 2.1			and 2.3			and 1.9			and 2.1		

Table 2. Economics of different systems tested in on farm trial

Cropping system	Gross return (Rs)	Cost of cultivation (Rs)	Net return (Rs)	B:C Ratio
Rice + Rice	36,900	14,100	22,800	2.61
Water chestnut + rice	1,12,800	42,050	70,750	2.68
Water chestnut and fish + rice	2,00,800	67,050	1,33,750	2.99
Water chestnut and fish + Rice + Black gram	2,22,900	71,050	1,51,850	3.13

was 0.9 t ha⁻¹ and in dry season it was 3.2 t ha⁻¹ (Table 1). When water chestnut was grown in wet season, average dry season yield of rice in the same plot was increased to 4.2 t ha⁻¹ which is 33% higher. In all the systems other than rice- rice system, average water chestnut yield was constant i.e. 15t ha⁻¹. The economics was calculated for all the systems and it was observed that only the rice-rice system followed in waterlogged area gave a net return of Rs 22,800 ha⁻¹. But when rice during wet season was replaced by water chestnut the net return increased from Rs. 22,800 to Rs. 42,050 although B:C ratio changed marginally from 2.61 to 2.68. When fish was added to the system, because of its adoptability in waterlogged area with water chestnut, the net benefit increased considerably up to Rs1,33,750 ha⁻¹. B:C ratio also increased to 2.99 in this system (Table 2). Sometimes, after dry season rice the residual moisture present in the soil could cater to a good black gram crop that had low water requirement. All farmers did not go for this option due to lack of time between black gram harvest and water chestnut planting for the next wet season. However, if a farmer is very dynamic, he can go for black gram cultivation also and get a net return of Rs 1,51,800 ha⁻¹ from the entire system with a B:C ratio of 3.13. The advantages of the water chestnut based

cropping system are no puddling is required for dry season rice after water chestnut, reduction of nitrogenous fertilizer requirement by 50% and reduction of irrigation cost by 25 to 30 percent.

Therefore, it is concluded that in deep water / waterlogged area water chestnut along with fish can easily be taken up in wet season followed by dry season rice for increasing the productivity of the system and for better livelihood in these areas.

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