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REDISCOVERING THE TRADITIONAL PADDY VARIETIES IN JHARKHAND: CONSERVATION PRIORITY IN HYBRID RICE ERA

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ABSTRACT

Introduction of hybrid rice has obviously broken the vicious cycle of low production, forced seasonal migration and poverty in rural Jharkhand. However, no hybrid can continue unless traditional pure lines are preserved. In Jharkhand, traditional varieties are fast declining and more and more farmers are giving up the cultivation of traditional paddy varieties. This is causing erosion of rich genetic diversity and also the knowledge of preserving the seeds of traditional varieties. This calls for preservation of traditional varieties both at research stations and farmers level. This article tries to rediscover traditional paddy varieties that existed in Jharkhand and institutional intervention for storing the genetic diversity. The article also attempts to explore ways to boost conservation effort for future research and development.

Introduction

Eastern India Green Revolution is one of the flagship programmes of government of India. Under this programme, achieving food security at household level through promotion of hybrid rice cultivation is one of the key strategies. During 2009-2014, cultivation of hybrid rice has spread like a blazing flame in all eastern Indian States including Jharkhand (Sinha&Sanga, 2013). Attaining food security at household level is a key indicator of Millennium Development Goals, hence cannot be

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negotiated. Absence of food security leads to seasonal labour migration from poverty stricken villages of Jharkhand and Western Odisha (Sinha & Sanga, 2013). Such migration often found to be detrimental to social, health and educational well-being of migrant families. However, spread of hybrid rice has caused growing desertion of cultivation of traditional paddy varieties (Dang et al., 2013). This is a catch 22 situation. Farmers are opting for hybrid rice because that offers both food security and more cash flow from marketable surplus. Nevertheless, erosion of traditional varieties poses two vital challenges: (a) how to conserve these varietal lines which are the basic requirements of future hybrid programme and (b) absence of these varieties at farm level would create seed slavery by the seed producing multinationals.Besides the above reasons, hybrid rice requires more water and fertilizer and any shortage of these two inputs substantially reduces its yield. For this reason during 2010-2014 whenever Jharkhand received less rainfall, production of hybrid rice failed to bring smile on farmers face. On the other hand, traditional varieties showed stable production potential even during semi-drought years. In this backdrop, this article draws the attention of scientists, rural development practitioners and other concerned people, first, for the rich diversity of paddy germ plasm existing in India in general and Jharkhand in particular, second, the adaptability of the traditional paddy varieties, and third,the need for conservation of rich paddy diversity. Our effort was primarily to compile the rich genetic diversity of rice/paddy existing in India vis-a-vis Jharkhand and current process of preserving this rich genetic diversity for future researches.

Paddy Cultivation in Jharkhand: Current Scenario

During 2013-14, in Jharkhand rice was cultivated in 1767 thousand acres of land. Out of this hybrid rice occupied almost 30 per cent area, higy yielding variety (HYV) rice occupied almost 49 per cent area and traditional varieties occupied remaining 21 per cent area. Total rice production in Jharkhand during the same year was 7136.5 thousand metric tonnes. Out of which hybrid rice contributed 44.5 per cent, HYV contributed 42.5 per cent and traditional varieties contributed only 13.0 per cent. Jharkhand currently consists of 24 districts. Out of these 15 districts are tribal districts officially recognised as Schedule V area. These districts together contributed 76.4 per cent area of rice cultivation and 73.8 per cent of rice production of Jharkhand during 2013-14. In the tribal districts, hybrid rice was grown in 34.4 per cent area, HYV in 47.8 per cent area and traditional varieties in only 17.8 per cent area (Table 1& 2). However, production-wise, hybrid contributed 45.7 per cent of production followed by HYV rice 42.9 per cent and traditional varieties 11.4 per cent.

Economics of Hybrid Rice and Traditional Varieties

During 2010-11 the average cost of production of hybrid rice worked out at ₹28,887.40 per hectare while for inbred rice (HYV) it was ₹23,549.66. Among the

components of total cost, expenditure on human labour formed the single largest item and accounted for 39.38 per cent and 46.82 per cent of the total cost for hybrid varieties and HYVs respectively. Machinery charges accounted for the next most important item at about 16-17 per cent of the total cost in hybrid and HYVs respectively. The cost incurred on fertilizer was the next one which formed about 13 per cent of total cost for both hybrids and HYVs. Manure and fertilizer together formed about 19 per cent of the total cost in case of hybrids as against 17 per cent for HYVs. The cost of irrigation, seeds and pesticides were significantly higher in hybrid rice production. Cost of irrigation was 12.49 per cent of total cost in hybrid rice while it was 9.33 per cent for HYVs. The seed accounted for 5.90 per cent of total cost for HYVs while it was 7.18 per cent of total cost for hybrids. Pesticide use was significantly higher for hybrid rice. It was about 2.05 per cent and 1.07 per cent of the total cost for hybrid and inbred rice respectively. Pesticide use was significant for hybrid rice implying that hybrid rice varieties did not possess adequate resistance to pest and diseases and are more susceptible to pests and diseases(Spielman et al., 2013). However, such comparative studies between hybrid and traditional rice varieties are not reported in recent times. What is known is the average yield of different rice varieties. In Jharkhand, while the average yield of traditional varieties is around13 q/ha, the hybrid rice yield is reported to be around 44q/ha (Table 1 & 2).

Table 1 : Coverage and Production Different Rice Varieties in Tribal Districts and in Jharkhand During 2013-14 (Area in '000'ha & Production in '000' M tonnes)*

Place	Hybrid		HYV		Traditional		Total	
	Area	Production	Area	Production	Area	Production	Area	Production
Jharkhand	529.5 (29.98)	3177 (44.5)	865.7 (48.99)	3030 (42.5)	371.8 (21.0)	929.5 (13.0)	1767 (100)	7136.5 (100)
Tribal districts (15 nos.)	464.5 (34.4)	2409 (45.7)	645.7 (47.8)	2262 (42.9)	239.8 (17.8)	599 (11.4)	1350 (100)	5270 (100)

Source: State Agriculture Department, Jharkhand.

*Ha=Hectare, Mton= Metric Tonne

Figures in parentheses are in percentage of row total.

Table 2 : Cultivation and Production of Different Rice Varieties in the Tribal Districts of Jharkhand During 2013-14 (Area in '000'ha & Production in '000' M tonnes)

Districts	Hybrid		HYV		Traditional	
Area	Production	Area	Production	Area	Production	
Ranchi	84(15.9)	504	67.2 (7.7)	235.2	16.8 (4.5)	42
Gumla	52 (9.8)	312	110 (12.7)	385	26 (6.9)	65
Khunti	21(4.0)	126	35 (4.0)	122.5	20 (5.3)	50
Simdega	22.5(4.2)	135	53.5 (6.1)	187.3	9 (2.4)	22.5
Lohardaga	23 (4.3)	138	15 (1.7)	52.5	9 (2.4)	22.5
Latehar	7 (1.3)	42	14 (1.6)	49	5 (1.3)	12
E Singbhum	30 (5.7)	180	68 (7.8)	238	12 (3.2)	30
W. Singbhum	52 (9.8)	312	94 (10.8)	329	40 (10.7)	100
Dumka	29 (5.5)	174	48 (5.5)	168	32 (8.6)	80
Pakur	13 (2.5)	78	25 (2.9)	88	11 (2.9)	27.5
Sahebganj	8 (1.5)	48	19 (2.2)	67	17 (4.5)	42.5
Devghar	14 (2.6)	84	25 (2.9)	88	13 (3.5)	32.5
Godda	13 (2.5)	78	20 (2.3)	70	13 (3.5)	32.5
Palamau	18 (3.4)	108	21 (2.4)	73.5	8 (2.1)	20
Garhwa	15 (2.8)	90	31 (3.5)	109	8 (2.1)	20
Total (Tribal districts)	464.5 (87.7)	2409	645.7 (74.5)	226.2	239.8 (64.4)	599
Jharkhand	529.5 (100)	3177	865.7 (100)	371.8	371.8 (100)	929.5

Source: Department of Agriculture & Sugarcane Development, Govt. of Jharkhand.

Figures in parentheses are in percentage of row total.

Genetic Diversity of Paddy in Jharkhand

Traditional varieties refer to those varieties which are adapted to local climatic and ecological situation and are cultivated and multiplied by farmers for at least last half a century. Traditional varieties are by and large ecologically adapted stable genetic strains. These varieties are the basis of any genetic improvement programme including hybrid varieties. If these varieties become extinct, human civilization will lose precious genetic inheritance. Rice belongs to the genus *Oryz* of, the sub-tribe *Oryzineae* in the family of Gramineae. The genus includes 24 accepted species of which 22 are wild and two Oryzasativa and Oryzaglaberrimma are cultivated. In India and Asia, Oryzasativa is cultivated. In India alone, around 4,000 varieties are reported to have been recorded (Burkill,1910; Ramaiah, 1953).

Central Rainfed Upland Rice Research Station (CRURRS), Hazaribagh identified around 600 rice varieties from Chotanagpur plateau and Santhal Pargana region of Jharkhand. Few institutes are trying to preserve these varietal strains. However, due to their internal policy, they did not share its information with the author. College of Biotechnology, Birsa Agriculture University has developed one gene bank for all traditional varieties of Jharkhand. National Bureau of Plant Genetic Resources (NBPGR) as on 31.01.2014 has preserved 97,279 gene strains of paddy in their National Gene Bank at -180 C (Dang et al., 2013).

During our study, the variety identification was done in two ways. While collecting the seed of a particular variety, the information given by the local farmers was relied upon. At the time of collecting seeds from the farmers, cross verification of authenticity of local varieties was ensured. Nevertheless, lack of scientific process of variety identification and selection was a lacunae of the current study due its anthropological emphasis. However, the collected seeds with varietal name were then given to CRUSS for verification and matching with their gene bank. The verification result of CRUSS was finally relied upon.

Paddy Culture among Oraons and Sadans

Jharkhand is primarily an agricultural State. It is a homeland of 30 tribes including eight primitive tribes. The economy of tribes in the State is primarily rural and predominantly agricultural. Tribes have rich knowledge about the indigenous practices especially in soil management, seed protection and post-harvest management on paddy. This traditional knowledge has been derived from the tribe's farming experience through trial and error method and handed down from previous generations to present generation. These indigenous methods and practices are very human in nature. This indigenous knowledge can be blended with existing scientific technologies to explore more sustainable and human-friendly methods of agricultural practices (Lakra et al., 2010).

Among the tribes, Oraon is the most progressive farming community. Their skill and involvement in agriculture keeps them ahead of other tribes. Sadans are non-tribal original settlers of Jharkhand. Their settlement in Jharkhand is as old as tribals. Sadans are found both among Hindus and Muslims. Both of them are agriculturists by and large. Other tribes and communities usually adapt farming practices from them. Our study is confined only to Oraons and Sadans of Jharkhand.

Heritage of Conserving Paddy Varieties in Jharkhand

Oraons and Sadans of Jharkhand conserve the traditional paddy varieties within their families. Method of seed collection is simple but insightful. Each family grows its choicest varieties with utmost care. They do not allow seed mixing. For the following season, normally seeds are collected from the central section of the selected plot. Women play an important role in seed selection. Seeds are not collected from borders of the plot. Seed collection is generally abandoned from the plot if there is disease and pest attack in that plot.

After collection of seeds, seeds are cleaned and dried properly and kept in Morha- which is made of straw along with dry cow dung and neem leaves. Morha is generally hung from roof to avoid any touch with the ground. Oraon and Sadan families claim that in this away they have maintained genetic purity for generations. Seeds are also treated as proud possession of family and not shared unless there is severe scarcity. However, sharing of seeds is by and large confined within the clan.

Knowledge of seed selection and storage is normally passed from one generation to another. However, after having formal school education tribal youth have become indifferent about this knowledge transfer. They have started relying on seeds available in market. Seeds of traditional varieties are seldom sold in the market place. Market agencies promote HYV and hybrid seeds for better commission. This trend is causing erosion of traditional varieties in many places particularly where access to market is convenient and easy. Traditional varieties are still dominant in remote villages than road side villages. This calls for intervention of agriculture universities, rice research stations and other interested bodies for the conservation of traditional varietal strains.

Rice Geography of Jharkhand

Jharkhand consists of two major plateaus namely, Chotanagpur plateau and Santhal Pargana plateau which includes Rajmahal hills. Two kinds of land are used for paddy cultivation namely, upland commonly called Tanr and low land locally known as Doin. Both upland and lowland, according to the fertility and slope, are sub-divided into three sub-groups each.

Upland or Tanr is sub-divided as Tanr I, II, III. Tanr I land, is the lowest steep of upland and most fertile in the upland. Above it lies Tanr II which is comparatively less fertile than Tanr I. TanrI II is the highest steep of upland

mostly used for human habitation and not so suitable for cultivation. Tanr I lands are mostly used for rice cultivation (i.e. sown by broadcasting or directly).

Table 3: Traditional Varieties of Rice/Paddy Currently Cultivated by Oraons and Sadans of Jharkhand

Type of Land					
Tanr I	Doin III	Doin II		Doin I	
Agni Sal	Alsanga	Asamiya	Raisisi	Agin Sar	Khanika Sar
Arsanga	Asanloya	Bacha Kalamdani	Rangi	Bacha Kalamdani	Kharika Khonchi
Arsunga Gora	Barijhinga	Barha Sar	Rani Kajar	Badshah Bhog	Kharkoili
Bhainsa Chandi	Bhora Rasi	Bakiras	Ras	Band Phul	Khira Bicha
Chali	Dahia Ras	Bans Phul	Santia	Barah Sar	Kishun Bhog
Chandra Gahi	Deo	Bhagwan Sar	Saraikela	Basmari	Kobi Phool
Chandra Galir	Don Karanga	Bhata Phul	Sikhar Bhunja	Bhara Phul	Lacchmi Vilas
Harakhunta	Gora Dhan	Bhosa	Sikhar Sar	Bhojni	Lal Dhan
Hidbaha	Guli	Chaina Bhog	Subarna (Bauna Dhan)	Bhorang Sar	Madhumal
Jaunga	Jhengne	Chhorki Kalamdani	Tanr Jhili	Dadkhani	Nanhia
Kala Gora	Kanaubar	Chingmohri	Tila Sar	Dahia	Numbri
Kanchi	Kanou	Dahia		Damodar	Pandubi
Karanga Gora	Karhani	Damodar		Dhusri	Prasad Bhog
Karhani	Kolamani	Dudhras		Dhusri Kalamdani	Ram Sar
Karyagara	Kore	Hesel Sar		Dourka Sal	Randu
Khating	Kusma	Jaya		Dudh Kobi	Rani Bhog
Lal Gora	Lapra	Jengne		Dudhkattar	Rani Kajar
Mehra	Neta	Jhalgenda		Gondli Phul	Rani Sar
Onukrakha	Rae Sari	Jhallar		Gopal Bhog	Ratgauni

(Contd...)

Table 3 *(Contd...)*

Type of Land				
Tanr I	Doin III	Doin II	Doin I	
Prasad Bhog	Rai Dhuni	Kairabera	Gundri Bhog	Rout Goli
Rai Chuni:	Rai Sari	Kala Parvat	Hardi Gunda	Safri
Rani Kajal	Rangi	Kalamdani	Hardi Sar	Sambalpuria
Sathi	Rata	Kanakchampa	Hathi Panjar	Samilai
Sudina		Kanau	Jabakusum	Sarai Nakhi
Syam Jira		Karanga Gora	Jeera Phul	Sarai Phul
Tainr-Ramsal		Karhani	Jhalak Genda	Sargi
		Katika	Jhiga Sar	Sikki
		Kera Ras	Jhili	Sonbudi
		Ketki	Jo Phul	Sonka Rka
		Lal Dhan	Jolea	Sonpiya
		Neta	Kabri	Sonpiya (Red)
		Newair	Kairabera	Sursuria
		Rai Chuni	Kala Jeera	Tengnusra
		Rai Sari	Kalamdani	Tewa
			Kalamkati	Tharh Musra
			Kapoor Bhog	Tila Sar
			Ketki	Tusi manjar

Low land or Doin is also sub-divided into three categories – I, II, III. Doin I is the lowest most land segment/strip of plateau land scape and most fertile land. Above this lies Doin II. This is also very fertile. Between Doin II and Tanr I lies Doin III. Doin lands are mostly used for paddy (transplanted) cultivation. A list of traditional varieties still cultivated by Oraons and Sadans are given in Table 3.

Traditional Varieties of Rice/Paddy of Jharkhand

There are numerous traditional (indigenous) varieties of rice/paddy which are

currently cultivated by the Oraons and Sadans of Jharkhand. With the introduction of hybrid rice, most Oraons and Sadans are fast switching over to hybrid varieties. However, our study could identify 26 upland rice varieties (Table 3) which are still being cultivated. Commonly they are called Gora Dhan but each variety has distinct characters. Likewise, we have found 23 varieties cultivated in Doin III, 45 varieties cultivated in Doin II and 74 varieties cultivated in Doin I land (Table 3). However, there are several varieties which are grown in more than one kind of land. For instance, varieties like BachaKalamdani and Lal Dhan are grown both in Doin II and Doin I. Eliminating the duplicity our research team could collect 146 varieties from the field which are still cultivated by the Oraons and Sadans in Jharkhand. As mentioned earlier, Central Rainfed Upland Rice Research Station (CRURRS), Hazaribagh identified around 290 varietal strains of rice from Chotanagpur plateau and Santhal Pargana region of Jharkhand. But many of these strains are given code name by CRURRS. Only 194 varietal strains are identified by local name and the same are recognised by CRURRS.

Upland Rice Varieties: During our study only 26 upland varieties could be found from Oraon and Sadan farmers in Chotanagpur region. These varieties were then matched with the CRURRS's gene bank for confirmation. Uplands are yet to be invaded by hybrid rice varieties. In all districts of Chotanagpur, mostly traditional rice varieties are grown in upland. Some farmers also grow improved upland rice varieties like Birsa Goda, Sita, etc. Upland rice is grown as purely rainfed crop. Agronomical practices are designed to take the benefit of early summer rain during the end of May and early June. Upland varieties are commonly of short duration, fast growing and low water requiring crops. The height of upland rice varieties varies from 2.5 to 3 feet. Grain to straw ratio varies from 40:60 to 35:65. These varieties mature by September and meet the early season cereal needs of tribal and non-tribal families. The upland harvest also helps farming families to clear the debts they incur for monsoon cultivation. Besides rice these varieties also provide good amount of straw for livestock.

Upland varieties are sown by broadcasting method (Buna). This helps in utilising soil moisture. Normally sowing is completed by June and if the rain is delayed it is continued till early July. Farmers usually rotate upland rice with mandua (ragi) or maize in two to three year rotation plan period. Upland rice are coarse grain but rich in nutrient. Apart from using it as staple food during 3-4 months, Oraons and Sadans also use it for making rice bear or handia. Goradhans are used for the Nayakhani (means eating the new rice after harvesting). Some of these varieties are used for making rice beer.

The agronomical culture and social and economic importance of upland rice varieties are given in Table 4. Upland rice is helpful in reducing the food shortages from September to November. Many farmers borrow money for growing low land paddy and other cash crop. Upland rice harvest helps them to repay the loan early and maintain household economy.

Table 4 : Varietal Characteristic, Agronomical Practices, Economic and Nutritional Importance of Upland Rice Varieties

Variety	Characteristics		Economic importance	Nutritional importance
	Seed (grain)	Agronomical		
Arsanga Arsunga Gora	1. Lightred colour 2. Size:6.1mm 3. Coarse rice	1. Short duration semi dwarf 2. Sown by broadcasting in June in the early rain after first shower, reaped in September end or early October	1. Low investment 2. Minimum use of fertilizers 3. Early maturity 4. Drought tolerant	1. Medicinal value 2. Preparation of rice beer 3. Grain is hard, non-glutinous and non-scented 4. Nutritious and hard grain; if villagers consume one time they can work in their field for whole day without feeling hungry
Khating	1. Light red colour 2. Size:6.1-6.3mm 3. Coarse rice	1. Sown by Broadcasting in June and reaped in September 2. Medium height	1. Low investment 2. Minimum use of fertilizers 3. Early maturity 4. Drought tolerant	1. Nutritious and hard grain; if villagers consume one time they can work in their field for whole day without feeling hungry 2. Hydrated starch (Mar) is thick
Dani Gora Lal Gora Kala Gora	1. Red colour 2. Size: 6.3 mm 3. Coarse rice	1. Sown by broadcasting in June at the beginning of rain 2. Early crop for farmers	1. Low investment 2. Minimum use of fertilizers 3. Early maturity 4. Drought tolerant	1. Nutritious and hard grain; if villagers consume one time they can work in their field for whole day without feeling hungry 2. Effective in gastric problem 3. Rich in carbohydrate, protein & minerals, 4. Hydrated starch (Mar) is drunk as food supplement

Table 4 *(Contd...)*

Variety	Characteristics		Economic importance	Nutritional importance
	Seed (grain)	Agronomical		
Bala Gora	1. Light red in colour 2. Size: 6.3mm 3. Coarse rice	1. Sown by broadcasting in June at the beginning of rain 2. Early crop for farmers	1. Medium investment, 2. Low grain yield, 3. Medium straw yield 4. Medium Drought tolerant	1. Good source of B1,B3 and carbohydrates , 2. Medium quality of rice beer is made 3. Hard grain and takes time to digest 4. Good for hardworking people
Jaunga	1. Red colour 2. Size:5.8 mm 3. Coarse rice	1. Sown by broadcasting in June at the beginning of rain and harvest in September 2. Blackish at Maturity crop 3. Early harvesting crop	1. Low investment 2. Minimum use of fertilizers 3. Early maturity 4. Drought tolerant	1. Good forlactating mother. It is believed that the Laddoo made from roasted rice mixed with sugar, eaten by lactating mother is helpful to produce milk and provide more nutrition to the breast-feeding child
RaiChuni Asanloya Tanr Jhili	1. White colour 2. Size: 6.3 mm 3. Fine rice	1. Sown by broadcasting in the end of June and harvested in December	1. Low investment 2. Minimum use of fertilizers 3. Early maturity 4. Drought tolerant	1. Parboiled rice is white fine and stick less 2. Grain is white hard, sub transparent, non-glutinous and non scented

(Contd...)

Table 4 *(Contd...)*

Variety	Characteristics		Economic importance	Nutritional importance
	Seed (grain)	Agronomical		
Rani Kajal	1. White colour 2. Size:6.3 mm 3. Medium scented rice	1. sown by broadcasting in June at the beginning of rain	1. Low investment 2. Minimum use of fertilizers 3. Early maturity 4. Drought tolerant	1. Parboiled rice is white fine and stick less 2. Grain is white hard, sub transparent, non-glutinous and non scented
Sathi	1. Deep red colour 2. Size: 7.5 mm 3. coarse rice	1. The variety escape drought to some extent 2. Grown as summer paddy 3. Spikelet – awn less, dark purple when young and light black at maturity	1. Insurance against malnutrition 2. Early maturity period 3. Need less water availability	1. Parboiled rice is sweet in taste 2. Hydrated starch is drunk as food supplement 3. Stale rice is also eat for 1-2 days after
Kannu	1. Light red colour 2. Size: 6.2 mm 3. Coarse rice	1. Sown by broadcasting in May and reaped in August 2. Thick stem so weeding is not done ,it might be broken	1. Low investment 2. Minimum use of fertilizers 3. Early maturity 4. Drought tolerant	1. Rich in carbohydrate, protein & minerals, 2. Parboiled rice is eaten, 3. Hydrated starch (Marh) is taken as food 4. Marh (starch water) boiled with green/dry leaves is taken as vegetable dish

Lowland Paddy Varieties: Lowland varieties are adapted to transplanted condition. Transplanted rice is agronomically called paddy. These varieties have higher yield than upland rice varieties. In Jharkhand, low land varieties take 120-140 days to mature. If upland rice ensures household food security for 3-4 months, lowland paddy ensures the food security for remaining year (i.e 8-9 months). Additionally, farmers also produce marketable surplus which ensures cash flow at household level to meet various household consumption. For this reason, farmers showed much inclination to HYV (High Yielding Varieties) and hybrid varieties for low land cultivation than traditional varieties.

Currently cultivation of various hybrid paddy varieties are spreading like blazing fire across the districts among all farmers irrespective of caste, creed and religion. However, in a study during July to September 2013, we found that 23 traditional varieties are still cultivated in Doin III, 45 varieties cultivated in Doin II and 74 varieties cultivated in Doin I land among Oraons and Sadans (Tables 3 & 5). However, there are several varieties which are grown in more than one kind of land. For instance, varieties like BachaKalamdani and Lal Dhan are grown both in Doin II and Doin I. Eliminating the duplicity, our research team could collect 120 varieties from the field which are still cultivated by the Oraons and Sadans in Jharkhand in lowland.

Table 5 : Characteristics, Agronomical Practices, Economic and Nutritional Importance of Lowland Rice Varieties

Variety	Characteristics		Economic Importance	Nutritional importance
	Seed	Agronomical		
Agin Sar Khanika Sar Bhorang Sar	1. Light red colour 2. Size: 6.2 mm 3. Medium coarse rice	1. Sown by broadcasting April-May and transplanted in July-August and reaped in November - December	1. Good yield even if rain fails 2. High paddy straw produce 3. flood-tolerant varieties 4. Good for poor and marginalised farmers.	1. Parboiled rice is good in taste 2. Good for hard working people in villages 3. Rich in minerals and vitamins 4. Cooked stale rice can be eaten for next day 5. Starchy water is very helpful to keep fresh and energetic
Badshah Bhog Chaina Bhog	1. White colour 2. Size: 5.5 mm 3. Short and fine light scented rice	1. Late winter paddy, sown usually by transplanted in July-August and harvested by 2nd week of Dec	1. Higher market prices than the HYVs. 2. Drought tolerance, good yield even crop damage 3. High paddy straw produced	1. Parboiled rice is fine white and stick less 2 Different cooking items is made 3. Unpolished rice is rich in B1 and B3 4. Less time to cook
Agni Sal TilaSar (sair)	1. Light red colour; 2. Size: 6.8 mm 3. Coarse (medium) rice	1. Medium duration crop, 2. Sown by broadcasting in June/mid July (Lewa)	1. Low investment, 2. Medium grain yield, 3. Tall plant, high straw yield, 4. Helpful for livestock	1. Rich in carbohydrate, protein & minerals, 2. Parboiled rice is eaten, 3. Hydrated starch (Marh) is taken as food supplement

(Contd...)

Table 5 *(Contd...)*

Variety	Characteristics		Economic Importance	Nutritional importance
	Seed	Agronomical		
Barah Sar Ram Sar Bhagwan Sar	1. Red Colour 2. Size: 6.9 mm 3. Fine rice	1. Sown by broadcasting and transplanted 2. Broadcast in April – May , transplanted in July- August and harvested in Nov-Dec	1. Long and high straw yielding 2. Stand upright even after the maturity of grains in the panicles	1. Hydrated starchy water (Mar) is very helpful to keep villagers fresh and energetic 2. Amount of rice rise while cooking
Bhojni Saraikela	1. Red colour 2. Size: 6.6 mm 3. Coarse rice	1. Sown by transplanted in July- August and reaped in November - December	1. Low yield but high straw strength	1. The red or brown unpolished rice is a healthy food because it provides with rice bran
Dahia	1. Light red colour 2. Size: 6.8 mm 3. Fine and long rice	1. Sown by transplanted in the month of July – August and harvesting in the month of Nov- Dec	1. Disease-resistant varieties 2. Thickness of the grain is large 3. Good yield potential even in drought	1. Parboiled rice is good in taste 2. Good for hard working people in villages 3. Rich in minerals and vitamins
Dhusri Rani Kajar	1. Light reddish brown colour 2. Size: 6.6 mm 3. Fine rice	1. Sown by broadcasting and transplanted 2. Broadcast in April – May , transplanted in July- August and harvested in Nov-Dec	1. Low Investment 2. Previous year stocked seed is used for cultivation 3. Less use of commercial fertilisers	1. Parboiled rice is good in taste 2. Good for hard working people in villages 3. Rich in minerals and vitamins

(Contd...)

Table 5 *(Contd...)*

Variety	Characteristics		Economic Importance	Nutritional importance
	Seed	Agronomical		
LalDhan Don Karanga	1. Light red 2. Size: 6.4 mm 3. Coarse rice	1. Sown by broadcasting and transplanted 2. Broadcast in end of April to early May, transplanted in July and harvested in Nov-Dec	1. Stand upright even after the maturity of grains in the panicles 2. Drought tolerant 3. Less investment 4. Non-shattering quality	1. Rich in vitamins and minerals 2. Good for hard working villagers 3. Sweet in taste 4. Less requirement of rice supplements 5. Laldhan is good for puffed rice/ pressed rice
Prasad Bhog	1. White Kernel 2. Size: 6.3 mm 3. Aromatic Fine rice	1. Generally transplanted in the month of July-August and reaped in November-December	1. Good market value 2. Medium straw yield 3. Straw liked by Livestock	1. Different food items are made 2. Less time to cook 3. Used during special occasions /festivals 4. Parboiled rice is white fine is less sticky
Jhaliar Geanda Chhorki Kalamdani Sambalpuria	1. White colour 2. Size: 6.5 mm 3. Fine rice	1. Sown by broadcasting and transplanted 2. Broadcast in April – May , transplanted in July- August and harvested in Nov-Dec	1. Long panicle 2. High straw yield 3. Non-lodging, saline-tolerant, drought-tolerant and flood-tolerant variety	1. Arwa rice used to make different cooking items 2. Parboiled rice is good in taste 3. Use in making local rice drink

(Contd...)

Table 5 *(Contd...)*

Variety	Characteristics		Economic Importance	Nutritional importance
	Seed	Agronomical		
Ketki Khira Bicha Rangi Chingmohri	1. White colour 2. Size: 5.8 mm 3. Medium rice	1. Sown by broadcasting and transplanted 2. Broadcast in April – May , transplanted in July- August and harvested in Nov-Dec	1. Hard and solid grain 2. Drought tolerant in nature 3. Tolerant to pests and diseases	1. Good cooking quality/taste 2. Hydrated starch (Mar) is drunk as food supplement 3. Good for hardworking village people
Sursuria Dudhras Newair Jaya	1. White colour 2. Size: 6.3 mm 3. Medium rice	1. Broadcast in April – May , transplanted in harvested in Nov-Dec 2. Weeding is done	1. Less investment 2. Minimum water consumption 3. Less requirement of commercial fertilisers	1. Rich in carbohydrate, protein & minerals, 2. Parboiled rice is good in taste
Sonachur Kishun Bhog Kapoor Bhog	1. White colour 2. Size: 4.8mm 3. Super fine scented rice	1. Sown by transplanting in the month of July-August and reaped in November-December	1. Tall and long panicle plan 2. High straw yield 3. Higher market prices than the HYVs.	1. Used during special religious or social ceremonies. 2. Suitable for making different cooking items 3. Very less time to cook
Motichur Nanhia Basmari	1. White colour 2. Size: 5mm 3. Super fine rice	1. Generally transplanted in the month of July-August and reaped in November-December	1. Good market value 2. Long straw yield 3. Good for livestock	1. Different food items are made with Arwa rice 2. Less time to cook 3. Used during special religious or social ceremonies.

(Contd...)

Table 5 *(Contd...)*

Variety	Characteristics		Economic importance	Nutritional importance
	Seed	Agronomical		
Megh Jawain	1. White Kernel colour 2. Size:5mm 3. Super fine scented rice	1. Sown by transplanting in the month of July-August and reaped in November-December	1. Tall and long panicle plan 2. High straw yield 3. Higher market prices than the HYVs	1. Used during special religious or social ceremonies. 2. Suitable for making different cooking items 3. Very less time to cook
Jeera Jawain	1. White Kernel colour 2. Size: 5 mm 3. Super fine scented rice	1. Sown by transplanting in the month of July-August and reaped in November-December	1. Tall and long panicle plan 2. High straw yield 3. Higher market prices than the HYVs	1. Used during special religious or social ceremonies. 2. Suitable for making different cooking items 3. Very less time to cook
Karmusal Sikki	1. White colour 2. Size: 6.3mm 3. Medium rice	1. Sown by broadcasting and transplanted 2. Broadcast in April – May , transplanted in July- August and harvested in Nov-Dec	1. High straw yield 2. Cost-effective 3. Less water requirement 4. Pests and disease tolerant	1. Thickness of grain is heavy so good for hard working villagers 2. Stale rice can be eaten for 1-2 days after 3. Starchy water is very helpful to keep fresh and energetic
Tulsimanjar Baans Phul	1. White colour 2. Size: 5.3mm 3. Super fine scented rice	1. Sown by transplanting in the month of July-August and reaped in the end of November and early December	1. Tall plant with high straw yield 2. Minimum investment 3. Higher market prices than the HYVs	1. Early cooking quality 2. Arwa rice is used in various religious or social ceremonies 3. Starchy water emits good fragrance 3. Arwa rice used to make pitha/idli /dosa (Chilka roti)

(Contd...)

Table 5 *(Contd...)*

Variety	Characteristics		Economic importance	Nutritional importance
	Seed	Agronomical		
Shaha Jeera SyamJira	1. White colour 2. Size: 5 mm 3. Super fine scented rice	1. Sown by transplanting in the month of July-August and reaped in November-December 2. Thin plant with long panicle 3.Proper irrigation is required	1. Higher market prices than the HYVs 2. Stand upright even after the maturity of grains in the panicles 3. Good market value	1. Used during special religious or social ceremonies. 2. Suitable for making different cooking items 3. Very less time to cook 4. Easily digestable, good for sick persons
Raisdhan Jabakusum	1. White 2. Size: 5.3mm 3. Medium fine	1. Sown by transplanting and broadcasting in the month of June, reaped in early December	1. Good market price 2. High straw	1. Good in taste 2. Raisedhan is known as 2nd Kalamdani 3. It is good for pressed rice
Hathi Panjar (Hathi Panja)	1. Reddish brown 2. Size: 5.8 mm 3. Medium coarse rice	1. Sown by only transplanting in Doin I 2. Base of stem is little blackish 3. Easy for weeding	1. Very high yield in normal conditions (no commercial fertiliser is used) 2. High straw yield, non- shattering 3. Strong straw so plants do not fall easily	1. Medium taste 2. Market value medium 3. Usna rice is preferred 4. Good for hardworking village people

Conservation Initiatives

Conservation of these rich genetic diversities to a large extent will ensure the survival of paddy cultivation during any epidemic attack, and failure of improved strains (as happened in Bt Cotton)**. Conservation of genetic can be done in two ways. First, by growing the variety every year either in research station or in farmer's field and preserving the freshly harvested seed for multiplication in the following year and second preserving seeds below -10^0 C in any suitable container free from any kind of damage. In this way seed can be multiplied once in eight to ten years.

NGOs like Gene Campaign have been trying hard to conserve the traditional paddy varieties at farmers field. Such initiative has added benefit of maintaining variety specific paddy culture alive at farmers level. This is important as ethnic group's several songs and dances have direct link with the varieties and their cultivation. These cultural dialect and heritage may be lost if farmers stop growing the variety.

Conservation of paddy variety at research station may be safer because these are handled by scientists with improved technologies. But scientists may not have the cultural bondage with the variety like any ethnic farmer or farming community. Lack of cultural touch and emotional bondage may develop a casual and routine attitude to the entire preservation aspects. This was evident when we observed that good number of varietal strains is kept with code number without having any name or description of varietal characters in several research stations.

The above mentioned research stations and plant genetic bureau have all latest technology to conserve the traditional paddy varieties for next few centuries at least. Preservation of gene bank is expensive. In the event of any severe varietal crisis will these centres be able to revive these varieties through rapid multiplication within a short period or only multinational seed firms will reap the full benefit of these gene bank is a matter of concern.

Conserving Biodiversity at Farm Level

Farm level conservation of biodiversity has multiple benefits. There is an old adage 'out of sight, out of mind'. This is quite applicable in biodiversity conservation. Existence of any species/plant varieties also helps in practice of conservation alive. The knowledge that evolves out of practice remains alive and may get refined as long as those particular species/plant varieties are in

** Bt Cotton was developed to combat against pink ball worm. After high success in initial years, this strain has reported to be attacked and damaged by pink ball worm.

vogue. Cultivation of traditional paddy varieties generated vast pool of agronomical knowledge among various tribes/castes. This knowledge is likely to be eroded once people stop cultivating the same.

Furthermore, farm level biodiversity conservation is also responsible for evolution of cultural heritage. These are expressed in the form of folklore, songs, dance, drama and arts. Many of these cultures will no longer exist once the tribe/people' group become disassociated with the plant/animal conservation (Singh, 1986; Singh & Singh, 2003; Xalxo, 2008). Oraons and Sadans of Jharkhand share a rich paddy culture in the form of folklore, seasonal songs/ragas, dances and arts. Rapid urbanisation has already caused much erosion of the paddy linked cultural heritage (Bahadur, 1997; Kaur, 2004; Keshari, 2003; Lakra, 1999; Mishra, 1978; Roy, 2004); Sachidananda & Prasad, 1996). Discontinuation of traditional varieties may hasten the further erosion of paddy culture heritage from the minds of the above tribes in particular and all paddy based communities in general.

Conclusion

If not for other reasons, but for economic and food security spread of hybrid paddy cultivation deserves continuation. This is complementary to GDP growth of any State on one hand and overall economic empowerment of farming community on the other. Therefore, no rational economic agenda can ignore the contribution of hybrid paddy culture. However, after almost half a century of gross rejection in human dietary requirement, oats has staged a major come back. Growing of oats is getting popular. This may be the silver lining for the entire conservation efforts of traditional paddy varieties. We need to explore a viable economic use of traditional varieties which will prevent these from being extinct as well as help in maintaining cultural heritage.

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