Diversity of Some Threatened Indigenous Rice Varieties Cultivated in Odisha, India

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Abstract

Traditional crop landraces play dynamic roles in the expression of native biological and cultural diversity via their central position in the genetic resource base, agro ecosystems and social heritage of indigenous peoples. This paper describes the diversity and distribution of traditional rice varieties cultivated in the interior localities of Kendrapara district, Odisha, India. A total of 69 varieties of paddy befitting the agro-climatic conditions of the place have been identified. The majority of them are disease and pest resistant varieties suitable for lowland cultivation. In addition, they are also resistant to water logging and flooding. These traditional varieties are being gradually replaced by the incorporation of modern rice cultivars in landrace cultivation areas, thereby threatening the existence of many invaluable traits present in such local varieties. A large number of landraces of paddy have disappeared from the irrigated fields since the adoption of high yielding varieties (HYVs). Conservation of the existing indigenous traditional varieties can play an important role in the development of sustainable agriculture and also valuable to the local farmers for agronomic, social and cultural reasons. The current research will hopefully help to improve, monitoring and management of traditional rice varieties and highlight their importance in maintaining agro ecosystem services.

***Key words*:** Local varieties/ Paddy germplasm/ Kendrapara district

1. Introduction

Rice (*Oryza sativa* L.) is the main crop used for staple food in India, where it is cultivated in irrigated or upland cultivation systems. It covers around 25% of the gross sown area (Singh, 1974) and plays an important role in Indian agriculture (Subudhi, 2008). Moreover, two thirds of the World's population, and particularly the South East Asians, eat rice as their staple food (Kulkarni et al., 1998). The Indians have a long tradition of rice cultivation. The country is supposed to be the centre of origin of rice, where maximum genetic diversity of this crop is seen. In fact, there were about 30,000 types of indigenous rice cultivars

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available in India (Maheshwari, 1987) possessing many interesting and beneficial characters befitting the diverse geo-climatic conditions of this land. But today only about 8000 botanically different varieties of rice are in existence in the whole world, out of which more than 4000 varieties are identified in India (Bajpai, 2004; Yadugiri, 2010). Odisha, in eastern India, harbours a rich diversity of rice varieties and is a premier rice growing state. The state has 0.44 million hectares of land under this crop, producing 10,322,325 tons of paddy per annum (Anonymous. 2010). The farmers of Odisha have cultivated traditional varieties of rice from time immemorial, the methods of which have been developed by continuous practice and trial. The knowledge acquired through long experience has been transmitted from generation to generation orally in the form of popular folklores and folk sayings (Mohanty, and Rout, 2001; Mohanty et al., 2008). However, this scenario changed in the latter part of the 20th century, as a result of which much of those landrace became extinct or are now-on the verge of extinction. The farmers of the country welcomed the hybrid revolution in agriculture (during the 1960s-70s) and gladly accepted the hybrid seeds for higher yield. Higher yields and greater food security have come at the expense of higher inputs of fertilizers and pesticides (Lu, 1996; Qualset et al., 1997). The extensive cultivation of this scientifically developed crop varieties has also led to serious “genetic erosion” - due to fast replacement of traditional varieties from agro ecosystems (Singh, 1999). About 74% of the crop area under rain-fed agro ecosystems is occupied by high yielding varieties and it could be even higher in irrigated ecosystems (Chauhan et al., 2000). As a result, the landraces and specifically the traditional rice varieties have lost their acceptability, and those of the indigenous rice cultivars became extinct, save a few in some interior places and tribal pockets of the country. Those landraces of rice, however, regained their importance in the final decade of the 20th century when the hybrid seeds failed to give the desired result due to attack of different infectious pests, diseases and other climatic hazards.

The loss of folk varieties, their evolution through selection, and the adaptation of new folk varieties from the outside are part of the on-going change of dynamic, small-scale, indigenous farming system. The rate of loss of folk varieties has increased with the modernization and

internationalization of agriculture, especially the introduction of modern crop varieties. However, the details of folk variety loss are difficult to discern, in part because there often, is not adequate quantitative documentation on past folk variety diversity to serve as a base line (Vaughan and Chang, 1992).To date there has been no comprehensive documentation within a region in relationship to the loss of farms, farmers, and farm communities. The collection, conservation and maintenance of traditional varieties have then become inevitable so that their traits like resistance to specific pests, diseases, salt and stress or erratic climate tolerance, can be saved and utilized in future for developing suitable new varieties. The International Board of Plant Genetic Resources (IBPGR) was established to conserve the genetic diversity of traditional rice varieties. The National Bureau of Plant Genetic Resources (presently Bioversity International), the premier central organization for conservation of germplasm in India in collaboration with IBPGR is taking steps to collect and conserve these genes. But all the interior localities and rural pockets of the state where the tribal and the rural folk still cultivate some of these landrace types are not covered for this purpose. In this context, reports from Kendrapara district of Odisha are still lacking. The present study was carried out in rural areas of the district to survey, explore and document the possibility of the existence of such unique indigenous rice germplasms with a purpose to preserve the threatened rice varieties of Kendrapara district, Odisha, India if any and to give scientists a basis for further studies. This paper will attempt to examine the potential role of folk varieties for sustainable food production, especially for small-scale, indigenously based agriculture.

2. Methodology

2.1 Study area

The study was conducted in all the nine blocks (*viz*., Aul, Derabis, Garadpur, Kendrapara, Mahakalpada, Marshaghai, Pottamundai, Rajkanika and Rajnagar) of Kendrapara district (20^o 21'–20^o 47' N and 86^o 14'–87^o 03'E) situated in central coastal plain zone of Odisha state, India (Figure 1). The site covers an area of 2644 sq km with a population of 1.558 million(2011 Census) and is bounded by Cuttack, Jagatsingpur, Jajpur and Bhadrak districts while a part of it is bounded by the Bay of Bengal. The coastline covers a 48 km stretch from Dhamra Muhan to Batigar. The area accounts for 1.7% of the

state's territory and shares 3.5% of the state's population. Agriculture is the main occupation in the area and the majority of the people (94.2%) live in rural areas. The district has a total of 144 thousand hectares net sown area (3% of the state's share) producing on an average 2.15 tons of paddy/ha/yr (Anonymous, 2010). The area is also known for its famous crocodile sanctuary at 'Bhitarkanika National Park' and Gahirmatha Sanctury for *Olive ridley,* besides numerous ancient shrines like "Baladevjew (Lord Balabhadra) and "Pancha Barahi" (the five mothers).

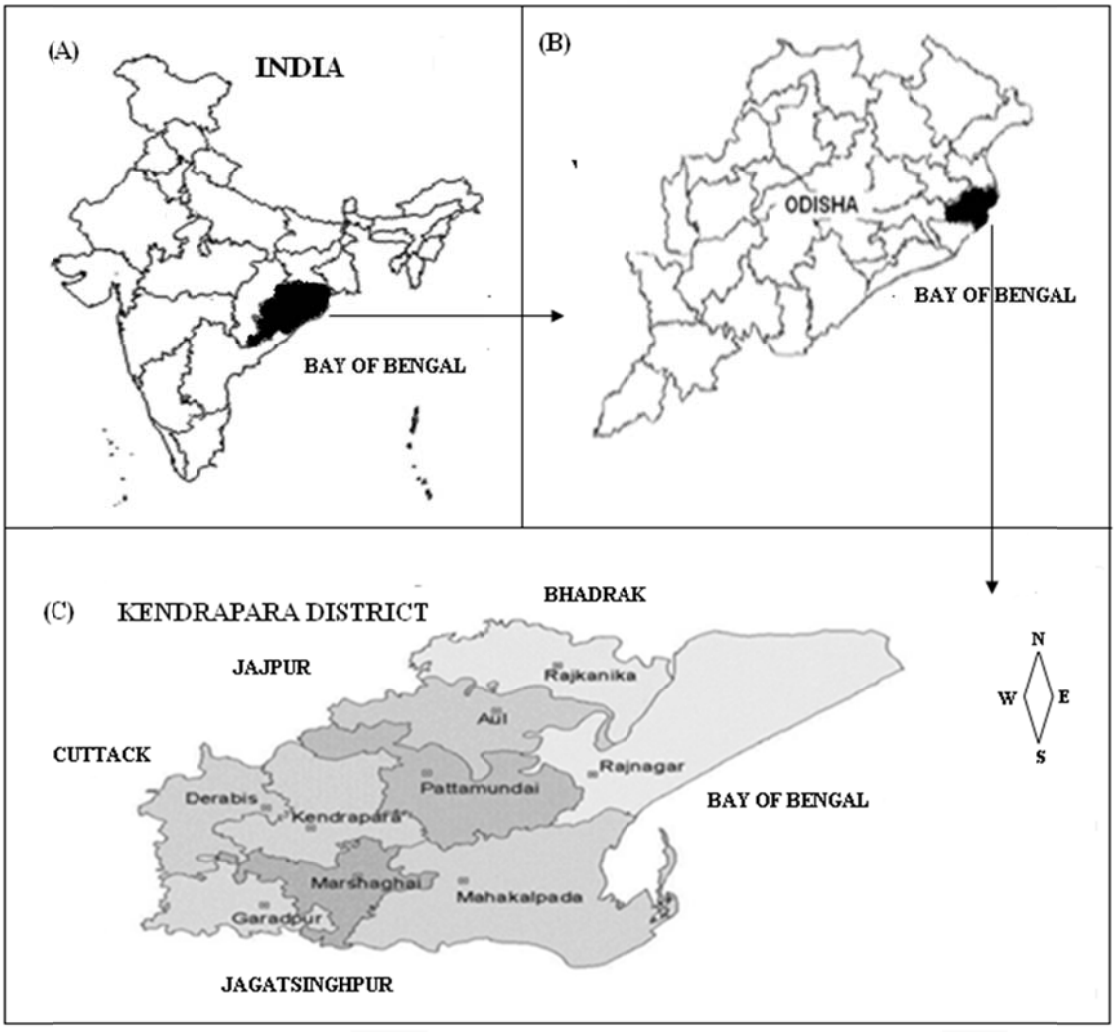

Figure 1: A) location of the Odisha state in the eastern region of India. B) map of Kendrapara district in central coastal plain zone of Odisha state. C) study area showing nine blocks of the Kendrapara district.

The climate of the study area is warm and humid, with three distinct seasons during a year; rainy (mid June to October), winter (mid October to

February) and summer (March to mid June). The air temperature ranges from 38^{o}C in summer to 13^{o}C in winter with an annual average 1500 mm rainfall (2006-2011). The district is located in the deltaic region with close proximity to the Bay of Bengal. Obviously, it has all the features of a costal climate i.e. saline weather, influence of coastal wind and is cyclone prone.

2.2 Data Collection

The people of Kendrapara district have cultivated the traditional variety of paddy from time immemorial. With the introduction of mechanized agriculture and high yielding variety of hybrid seeds there have been changes in farming patterns. But a few rural and tribal farmers in some interior pockets still adhere to -the traditional methods using the indigenous rice germplasm inherited from their ancestor's centuries ago. The data were collected for 2 - years (July 2009 to June 2011) using a pre-tested semi-structured questionnaire, group meetings, focused discussions and whenever necessary, spot verification during the crop growth periods and harvests. During the field survey - aims, methods, anticipated benefits of the study were adequately explained to the informants and due consent was given by the local people in this regard to publish the information obtained from them.

The villages where paddy is the chief agricultural product were covered with prior information collected from the district agriculture office as well as the block headquarters. Few exploratory visits and meetings with village institutions were made prior to actual selection of the villages and the information gathered through these exercises helped to randomly select 5-6 villages under each of the nine blocks mostly located away from the main road. About 10% of the households growing indigenous rice in the area were considered as the sample size for the study and during the group discussions, an equal representation of both men and women folk was ensured so as not have any bias in data collection. Four hundred sixty questionnaires were administered to different respondents (Table 1) using snowball probability sampling techniques. These were complimented with random visits to the respondents' fields. The questionnaires were divided into two parts. Part A was used to collect personal data of the respondents while Part B focussed on the issues concerning indigenous rice cultivation. The household questionnaire consisted of demographic and socio-economic information on the household,

including variables such as sex, age, income, education, and household size, land holding size and division of labour on farm operations. Information concerning the characters of particular rice germplasm, cultivation practices, land and soil suitable for a definite traditional variety, necessity of water, amount of yield or any other typical character of a land race variety etc. were collected and recorded. In addition, information was collected specially from the womenfolk on threshing quality, cooking quality, increase in volume after cooking and eating quality. The yield and other relevant data obtained through questionnaires were further supplemented by few spot visits especially during harvests and the rice samples were collected from the farmers using standard format. Some help from elderly knowledgeable persons was also sought in identification of a particular rice variety, which was further verified for its accuracy from the leading rice research institutes in the state *viz.*, Central Rice Research Institute (CRRI) and Orissa University of Agriculture & Technology (OUAT). Further, information on different varieties of rice grown previously but non-existence now and the probable reasons for their disappearance, were also noted. Varieties which are going to be extinct very soon are indicated with asterisk marks.

Table 1: Age class and gender structure of the respondents in nine different blocks of Kendrapara district, Odisha.

Block	Sex	Age-class							
		21-30		31-40		41-50		51-60+	
Aul	M	2		6		12		7	
	F	3	5	5	11	11	23	4	11
Derabis	M	6		8		7		10	
	F	3	9	4	12	4	11	8	18
Garadpur	M	7		9		10		14	
	F	3	10	6	15	4	14	7	21
Kendrapara	M	5		8		18		2	
	F	3	8	7	15	5	23	2	4
Mahakalpada	M	7		8		9		8	
	F	2	9	6	14	6	15	4	12
Marshaghai	M	6		4		12		5	
	F	6	12	4	8	8	20	5	10

Table 1: (continue)

Block	Sex	Age-class							
		21-30		31-40		41-50		51-60+	
Pottamundai	M	3		12		8		5	
	F	2	5	8	20	8	16	4	9
Rajkanika	M	4		9		13		8	
	F	3	7	4	13	5	18	4	12
Rajnagar	M	8		6		10		5	
	F	6	14	6	12	6	16	3	8
Total (%)	M	10.43		15.23		21.52		13.91	
	F	6.74	17.17	10.87	26.1	12.39	33.91	8.91	22.82

3. Results

The data were collected from our field surveys from a total of 460 respondents (men 61.09% and women 38.91%). Among the interviewees, 17% were of age 21–30 years,26% were of age 31–40 years, 23% were 51-60 years old or more and 34% were of age of 41–50 years (Table 1). The respondents provided information regarding the common names, nature of land , plant height (in feet), grain size, colour, average yield (q/ha) and specific character/use of the traditional rice landraces in Kendrapara district of Odisha, India. The participation of the local people during the field survey reflects an increasing interest by the local population in protecting the traditional rice varieties. The results reveal that 69 varieties of traditional paddy germplasm were cultivated in the surveyed area (Table 2). From Table 2, it is evident that except for a few varieties viz. 'Asina', 'Badibiyali' 'Basumati', 'Kalama', 'Puntia', 'Sathia' or 'Suryakanti', the majority are late varieties, which take around six months for harvesting. The different varieties were cultivated suitable to the nature of the land(Figure 2a) i.e. low (39.1%), high (11.6%), moderate (8.7%), medium (31.9%), moderately low(5.8%), moderately high(1.45%), and very low(1.45%).Cultivation of red, yellow, grey, black and white rice landraces (Figure 2b) over thousands of years have created a rich biological (genetic) diversity interwoven with an even richer diversity of cultural and spiritual traditions. Out of 69 varieties, seventeen varieties are on the verge of extinction and the remaining 52 are in a threatened state. The extinction of a good number of rice varieties is not a healthy sign for the ecosystem. Results revealed that some scented or aromatic rices

are also cultivated having a pleasant flavour in their grain which emits a nice odour when the rice is cooked (Figure 2c).

Table 2: Types and characteristics of traditional rice germplasm of Kendrapara district, Odisha.

Name of the variety	Nature of the land	Plant height(feet), grain size and colour	Average yield(q/ha)	Specific character/Use
Ajanajari KR-127	Low	5.0 , long , thick ,red	21.2	Early variety, suitable for sundried rice.
Asina KR-132	High	4.0 , medium thick ,white	23.4	Early variety, suitable for par boiled rice.
Angada KR-102*	Low	4.5 , medium , thin ,white	26.5	Suitable for par boiled rice.
Basumati JR-18	High	3.5 , long , narrow and white	26.2	Early variety, scented and suitable for rice pudding.
Baula KR- 64	Low	5.0 , medium ,faint red	24.5	Suitable for fried and flattened rice.
Baunshagaja KR 29	Moderate	5.0 , medium ,thin ,white	27.8	Par boiled rice.
Bhundi KR-59	Low	5.0 , medium ,thick , black	24.4	Par boiled rice.
Bilandi KR-46	Moderate	4.5 , medium ,thick , grey	25.3	Resistant to flood, par boiled and water rice.
Badibiyali KR-24	Low	5.0, small ,thick , white	21.5	Early variety, suitable for rice pudding.
Benachera KR-32	Low	6.0 , medium ,thick ,white	19.5	Par boiled and flattened rice.
Bhundi KR-26	Low	5.0 , medium ,thick ,grey	21.5	Suitable for cake.
Champeisiali KR-31	Low	4.5 , medium ,thick ,faint yellowish	24.3	Suitable for fried rice
Chakrakenda KR-52	Moderate	5.0 , small ,thick ,grey	26.4	Suitable for fried rice.
Chhatuari KR-13	Medium	4.5 , medium ,thick ,white	21.5	Par boiled rice.
Dhala puntia*	Medium	4.5 , small , awaned ,thick , white	22.3	Early variety, suitable for par boiled rice.
Dhusura KR- 05	Low	5.0 , medium ,thick ,faint red	21.4	Suitable for boiled and fried rice.

Table 2: (continue)

Name of the variety	Nature of the land	Plant height(feet), grain size and colour	Average yield(q/ha)	Specific character/Use
Dhikinasali*	Medium	5.0 , small , thick ,white	22.7	Par boiled rice.
Ghusuritinka*	Medium	5.0 , small ,thick ,white	20.5	Par boiled rice.
Gudumatia*	High	5.0 , medium ,thin ,grey	23.5	Fried rice.
Hamira KR 37	Medium	4.0 , medium thick ,faint yellow	23.9	Par boiled rice.
Hadarala KR-71	Low	5.0 , small ,thin ,white	19.5	Early variety suitable for rice pudding.
Harimuti*	Medium	4.5 , medium ,thick ,white	18.7	Par boiled rice.
Jagabandhu KR-11	Medium	4.5 , medium ,thick ,white	25.5	Rice cake.
Kalabati KR-27	High	4.0 ,small ,thin ,white	24.2	Sundried rice.
Kalabanki KR-51	Medium	4.5 , small ,thin ,faint red	20.8	Flattened rice.
Kakharua KR-62	Medium	4.0 , medium ,thick ,white	21.5	Par boiled rice.
Kalakhuda KR-41	Low	5.0 , medium ,thick ,black	24.5	Par boiled rice.
Kalajira*	High	5.0 , small ,thick ,white	17.9	Rice pudding
Kalaktaki KR-49	Moderately low	5.0 ,small ,heavy and blackish grey	24.4	Cooked and watered rice.
Kalama KR-84	Medium	4.5 , awned medium , heavy, black	18.5	Early variety, par boiled rice.
Kalamegha KR-06	Medium	4.5 , medium ,thin ,grey	20.5	Par boiled rice.
Kalamunha KR-15	Low	4.5 , medium ,thick ,black	25.3	Par boiled rice.
Kartik KR-73	Low	5.0 , medium ,thin ,white	20.8	Rice cake.
Kaladhusuri KR-103	Moderately low	4.5 , long narrow and blackish	24.6	Suitable for cooked and flattened rice.
Kalamabanka KR-53	Moderately low	4.5 , long narrow, curved and grayish	23.4	Flattened rice.
Koilimunda KR-114	High	4.5 , medium ,thin ,white	20.5	Early variety, par boiled rice.

Table 2 (continue)

Name of the variety	Nature of the land	Plant height(feet), grain size and colour	Average yield(q/ha)	Specific character/Use
Laxmi KR-54	Medium	5.0 , long ,thick ,white	20.9	Early variety, par boiled rice and cake.
Laxmikajala*	Low	5.0 , medium ,thick ,grey	22.3	Par boiled rice.
Machakanta*	Moderate	4.5 , long , narrow ,little curved and white	24.9	Scented, suitable for rice pudding.
Mahalaxmi KR-47	Low	6.0 , thick , grey	19.5	Suitable for rice pudding.
Meghamala KR-09	Low	5.0 , small, thin white	24.5	Suitable for rice pudding.
Meghanada*	Moderately low	4.5 , medium and black	23.4	Cooked and flattened rice.
Motougiri*	Low	5.5 , medium ,thick ,black	27.1	Suitable for par boiled rice.
Mutisamulu KR-36	Low	5.5 , medium ,thick ,black	27.1	Suitable for par boiled rice.
Mugudi*	Low	5.0 , medium ,thick ,red	27.1	Suitable for par boiled rice.
Nadiaphula*	Moderate	4.5 , short, thick and white	24.9	Lightly scented, cooked rice.
Nalinrushingha KR-02	Medium	5.0 , medium ,thin ,red	22.5	Sundried and flattened rice.
Nalipatini KR-112	Low	5.5 , long ,thick ,red	27.6	Flattened and fried rice
Nilabati KR-42	Medium	4.5 , medium ,thick ,white	21.8	Rice pudding, sundried rice.
Nikiri KR-08	Medium	4.5 , medium ,thin ,white	21.8	Par boiled rice.
Pakhiasali*	Medium	4.5 , medium ,thick ,white	21.7	Flattened rice.
Panitaras KR-113	Low	6.0 , thick ,grey	26.6	Flattened rice.
Patini KR-96	Low	5.0 , long , thick and white	29.5	Resistant to water logging, flattened and roosted rice.
Parbatkaya KR-117	Low	6.0 , thick ,black	24.8	Rice cake.

Table 2: (continue)

Name of the variety	Nature of the land	Plant height(feet), grain size and colour	Average yield(q/ha)	Specific character/Use
Pindagadi KR-17	Medium	4.0 , medium ,thick ,white	25.5	Par boiled rice.
Puntia KR-27	Moderately high	4.0 , long , thick , long awned and white	23.4	Early variety, cooked rice.
Rabana KR-58	Very low	5.5 , long ,thick ,awned and white	31.2	Resistant to flooding, cooked and flattened rice.
Rajballav KR-101	Medium	4.0 , medium ,thick ,red	25.5	Par boiled rice.
Rajmalli*	Medium	5.0 , medium ,thin ,grey	25.5	Flattened rice.
Rangi KR-91	Low	5.0 , long ,thick ,faint red	28.9	Flattened and fried rice.
Raspanjari*	Low	5.0 , long ,thin ,white	28.9	Par boiled rice
Ratanchudi KR-111	Medium	4.0 , medium ,thick ,faint red	25.5	Par boiled rice.
Sabitapatini KR-10	Low	5.5 , long ,thick ,white	28.6	Flattened and fried rice.
Sanara*	Medium	5.0 , medium ,thick ,grey	24.9	Flattened rice.
Sathia KR-21	High	4.5 , long ,thick and white gray	23.4	Early variety, cooked rice.
Sarukajala KR-116	Low	5.0 , small ,thin ,white	27.8	Par boiled rice
Sula-KR-123	Medium	5.0 , medium ,thin ,white	23.8	Par boiled rice
Suluri Champa KR-69	Moderate	4.0 , narrow, medium and white	28.1	Cooked rice.
Suryakanti KR-33	High	4.0 , long ,thick ,medium and white	25.6	Early variety cooked and flattened rice.

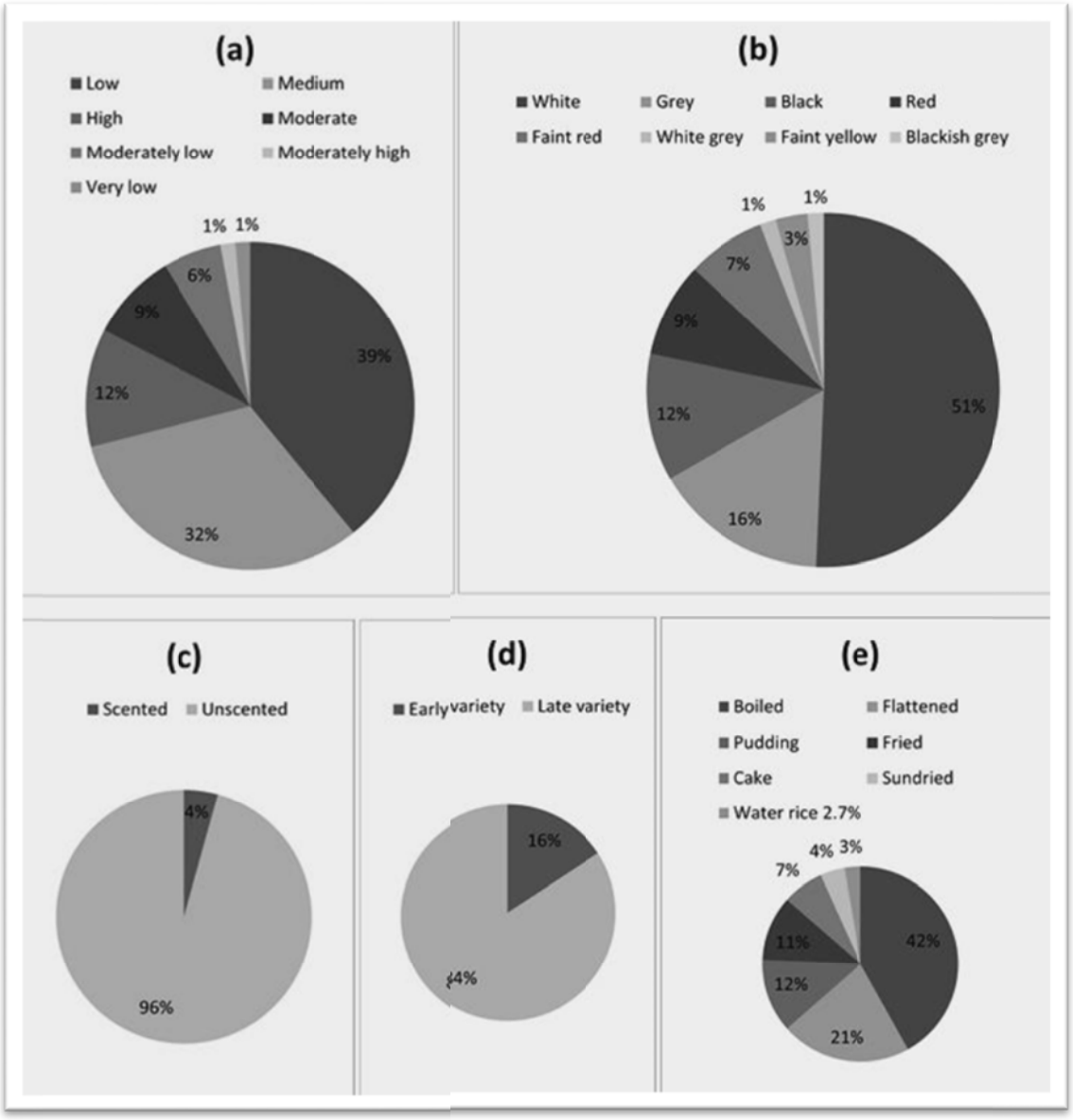

Figure 2: Percentage contribution of (a) different natural land type used for cultivation of traditional rice varieties (b) various grain colour of the different landraces (c) scented and unscented traditional rice varieties identified by local inhabitants (d) late and early varieties growing in the local environment and (e) folk rice varieties selected for various food preparations in Kendrapara district of Odisha, India.

The present study indicates that the small and marginal farmers of this locality cultivate the early variety to supplement their meagre food during crucial months of the year i.e. September and October. These varieties are also suitable for lowland cultivation, which can withstand water being logged as well as flooding, a common phenomenon of this district. Most of the traditional rice varieties cultivated in the study area have longer duration (Figure 2d). Moreover, rice has

served as the cultural basis for the development of ethnobotanical traditions, such as the construction of intricately woven baskets to store harvested paddy and related products. Farmers preferred to cultivate certain traditional varieties based on their specific characteristics e.g. those with high yields, palatability of straw to cattle, suitability for the preparation of different local dishes such as cooked rice, fried rice and parched paddy colloquially called ‘Mudhi’ and ‘Khai’, flattened rice and watered rice (Figure 2e). While any rice variety can be used for different food preparations, there are special varieties, which are specific to food types. The seeds of such varieties were available in most villages, but they were cultivated in smaller areas and also were limited to a small number of farmers. Traditional rice seeds were exchanged through farmers only. Farmers kept a certain portion of their harvest as seeds for their own use, but they also sold the rest to their neighbours in the village. Usually these kinds of seeds were sold at higher price than that of ordinary grain.

4. Discussion

The wide genetic diversity of rice (*Oryza sativa* L.) is represented in several hundred thousand varieties developed by natural and human selection (Grubben and Partohardjono, 1996), which is in contrast to the smaller number of 'varieties', which are usually the product of institutional breeding. Over the millennia, landraces evolved as farming households consciously and subconsciously selected phenotypic traits leading to the development of new genotypes habituated with wide range of environmental conditions: from intensively managed monocultures of irrigated rice to extensive fields of drought resistant rice (Grubben and Partohardjono, 1996; Gao, 2003).Moreover, farmers using traditional techniques have been shown to value diversity in its own right (Shigeta, 1996). The increasing threat of the Green Revolution (using genetic engineering), these so-called ‘scientific’ and ‘modern’ varieties has brought significant ecological and socio-econ-cultural changes in farming practices (Palmer, 1976; Norland et al., 1986). During the present investigation, it was observed that in some places the planting of native varieties has been actually forbidden; though the goal of high productivity has, above all else, been responsible for the exclusion of local varieties. This present finding is in agreement with Lansing (1991).

As climate change has made frequent floods and prolonged droughts the order

of the day in Kendrapara district, the modern high yielding rice varieties and hybrids suffer the most, leading to a partial or total loss of crops. Conversely, the genetic variability of traditional land races provides some built-in insurance against hazards of diseases and pest; and they provide some good yields despite drought, standing water, hail, frost, diseases and pests etc. (Mehra, 1981). Such indigenous plants have the ability of physiological adaptation, suitable for a particular area i.e. mixed cultivation, along with fish, duck and molluscs. Most of them produce a good yield, requiring no chemical fertilizer or pesticides. Again, the straw of the traditional varieties are hardy and lustrous suitable for thatching houses in comparison to that of the high yielding varieties. It is evident from the Table 2 that the traditional varieties have the potential to provide farmers' livelihoods and thus provide a strong argument for the cultivation of more native varieties. But due to the high production of hybrid varieties even with the use of fertilizers and pesticides most of the farmers have not utilized their total land for rice production as they can produce sufficient yields with minimum land use. As a result many fertile agricultural land remains uncultivated, and will become wild if this practice continues for a long period. Thus the introductions of hybrid varieties have made a direct impact on agricultural land utilization. Moreover, the Koraput district of Odisha is believed to be the home where rice originated. It is evident from the availability of more than 300 local varieties of paddy which are still cultivated by the tribal farmers employing age-old methods of agriculture. It is because of this that the place was recently declared by the FAO as a globally important agricultural heritage. This homeland is vitally important to plant breeders, because it is where the greatest genetic diversity of the crop is available. Such diversity is the safety net that ensures that no disease, pest or environmental change can send a species to extinction. This genetic pool or germplasm is the key to this century's greatest advance in crop breeding. There is an urgent need to collect, evaluate and conserve the genetic resources from the field where it is still cultivated (Ishiwaka et al., 2000). On farm conservation of landraces, it is useful to preserve the evolutionary process, which generates new genotypes under natural selection (Gao, 2003) and, for this reason, the small farmers must be stimulated to keep

cultivating this important germplasm in India. Realizing the importance of the landraces, several international as well as national research organizations are taking steps to collect and conserve such valuable germplasms. The present study can provide a baseline data for the proper maintenance and conservation of valuable paddy germplasm that is available and cultivated in this region.

5. Conclusions

The present study indicates the persistence of traditional rice cultivation practices in Kendrapara district of Odisha, India. The local communities still depend on it, it is also influences their culture and socio-economic aspects. It also provides a cheaper and more accessible variety of food grain as opposed to the more expensive hybrid varieties. But these indigenous types of rice are under serious threat of extinction due to the arrival of high yielding varieties. Conservation of the existing folk varieties is of prime and urgent importance because they can play an important role in the development of sustainable agriculture for the future. To preserve the genetic variability in rice landraces farmers must be stimulated to keep cultivating this important germplasm in Kendrapara district,Odisha. Efforts to conserve agro-ecosystem biodiversity and preserve traditional paddy germplasms need to be combined and enhanced for the benefit of posterity.

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