Indigenous Agricultural Knowledge in Rainfed Rice Based Farming Systems For Sustainable Agriculture: Learning from Indian Farmers

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INTRODUCTION

Farmers in developing countries have quite a sophisticated knowledge of agriculture and natural resources management, which are recognized to be more eco-friendly and sustainable. This knowledge is based on many generations of insights gained through close interaction within natural and physical micro-environments (Amusan, 1996; Rajasekaran et al., 1991 and Kolawole, 2001). Indigenous knowledge (IK) is dynamic, changing through indigenous mechanisms of creativity and innovativeness and contact with other local and international knowledge systems (Warren, 1991). Indigenous knowledge systems (IKS) may appear simple to the outsider but they represent mechanisms to ensure the minimal livelihoods for local people. IKS are often elaborated and adapted to cultural and environmental conditions (Warren and Cashman, 1988). They pertain to various cultural norms, social roles or physical conditions. The diversity of IK deals with the trial and error problem solving approach. It is influenced by the adaptive skills of local people, usually derived from many years of experience (Thrupp, 1989), time tested practices in nature, strategies and techniques developed by the local people to cope with changes in their socio-cultural and environmental conditions and accumulated by farmers through constant experimentation and innovation (Rajasekaran, 1993 and Kaplowitz, 2001).

The overwhelming majority of farmers in most developing countries is small-scale farmers, each working on less than two hectares of land. These farmers represent hundreds of distinct languages and ethnic groups. In most instances, the knowledge systems of these farmers have never been recorded systematically in written form; hence they are not easily accessible to agricultural researchers, extension workers, and development practitioners (Warren et al., 1993 and Warren et al., 1995). While they remain invisible to the development community, many indigenous organizations are operating in rural communities to search for and identify solutions to community problems (Gupta et al., 1996). Recent studies about indigenous knowledge in agriculture is having some effect; indeed, it has changed the attitudes of policy makers and agricultural development planners in recent years, and this has led to renewed interest in this type of knowledge (Gupta et al., 1996 and Sillitoe, 2001).

This paper examines the importance of IKS and its role in enhancing sustainability in agriculture whiles natural resources. An attempt has been made to identify tribal farmers' wisdom and their local know-how used in the management of rice farming and its associated dynamics.

THE STUDY AREA

The study area comes under the Bastar plateau which has a sub-tropical climate and covers 3786.1 thousand ha. The rainfall varies from 1400 to 1600 mm while the total rainy days varies from 65 to 82 days. The topography is almost undulating with moderate to steep slopes which cause severe erosion. The total population of the district is about 20,089,966 out of which 68 per cent are tribal people who reside in about 3,382 villages. Seventy-five per cent of the population is depended on agriculture and its allied activities for their livelihoods. The total cultivated area is about 877.7 thousand ha of which 64.7 per cent is rice, 15.6 per cent *Kodo-Kutki* (millet crops), 2.4 per cent gram, 1.9 per cent *Lathyrus*, 0.01 per cent groundnut, 1.8 per cent rapeseeds and mustard, and 3.6 per cent is linseed.

Basically, two tribal communities called *Halba* and *Gond* are examined in this study. They are a major part of the society. *Halba* is forest tribe that mainly engages in farming. It occupies a relatively respectable position in the Bastar district. (Russell and Lal, 1975). *Gond* is also a principal forest tribe of the Dravidian family and perhaps the most important of the non-Aryan tribes in India. In the central province, the *Gond* occupy two main tracts. The first is the wide belt of broken hills and the forest areas of the Satapura

Fig. 1. The Map of Keskal developmetalblock under Bastar district of Chhatisgarh state showing the areas of study

hills. The second is predominantly an inaccessible mass of hills extending to the south of Chhatisgarh plains which comprise Bastar and Kanker districts (Russell and Lal, 1975).

METHODOLOGY

In the social sciences, there are basically two approaches for carrying out: research quantitative (relational) and qualitative (explanatory). Considering to the nature of the study, the qualitative approach has been adopted to carryout research. The study investigates how we learn from local people and how they perceive, value, use and conserve the environment and natural resources (Braiones, 1996 and Mandonda, 1997). The research was carried out in a purposively selected Keshkal block of Northern part of Bastar district, Chhatisgarh State, India, on the basis of ethnicity, geography and paddy-based farming systems (Pidatala, 2001). In the first stage, 10 villages were visited to investigate the diversity in indigenous knowledge. During the second stage, out of 8 villages, 4 villages (50 per cent), namely Ateconhadi, Kachharpara, Adenga, Batrali, and Undari dominated by the *Gond* tribe, were selected purposively for investigation. Following the same procedure, 5 villages, namely Tampal, Palam, Kukanar, and Kokada dominated by the *Halba* tribe, were selected from the southern part of the district. The purpose of sampling from two different places comprising different tribes was to find out similarities and variations in existing indigenous farming practices. A representative group of 15 farmers of various ages from each village were selected for conducting personal interviews and focus group discussions on indigenous agriculture practices (Kaplowitz, 2000). It is important to note that for IKS, interviews or group discussion cannot yield complete scientific results. Therefore, in order to satisfy this objective, a combination of different methodologies was adopted in this study. With the help of farmers, a transect walk was done to identify the different micro-farming situations considering variations in the biophysical indicators perceived by tribal farmers (Kaihura et al., 2003). This helped to differentiate the variations between different types of soils, cultural practices and cropping system diversity. A combination of group discussions and semi-structured interview methods was used to explore the different location specific indi-genous paddy varieties. In each selected village, agro-ecosystem analysis and resource flow maps were constructed to facilitate the study of the current use of natural resources and the different indigenous crop varieties and their conservation practices. A group of experienced scientists comprising two each from Agronomy, Soil Science, Botany, Plant Pathology, Entomology, Ecology and Rural Sociology were selected to discuss the scientific rationality of documented indigenous agricultural practices.

RESULTS AND DISCUSSIONS

Strategy for Variety Conservation

The farmers have developed a set of strategies to select the seeds, maintain seed stocks and anticipate climate changes (Sibanda, 1998 and Kieft, 2001). The indigenous paddy varieties have become an integral part of the farming system and are maintained and developed on account of indigenous ways (Singh, 2003a). It is argued that these strategies are important and are part of the local culture. Farmers have succeeded in conserving these varieties by mass selection. For predicting the rainfall and weather conditions, different biophysical indicators are considered. Forecast of rainfall is done by elderly men (often called wisemen). The forecasts are based not only on biological indicators, such as the fruiting of mango trees, movement of ants, plying of certain birds, insects, but also on the basis of spiritual indicators. In years rain forecasts are good, women tend to prepare more rice seeds and maize varieties that are short. In dry years, they prepare more drought resistant plants, such as stalked foxtail millet, *Kodo, Kutki, foxtail millets, finger millets, kulthi* and sorghum varieties. Bandyopadhyay and Saha (1998) have also reported similar kinds of results for rainfed agroecosystems. The tribal people are well aware about the importance of seeds and their correlation with the production of crop. There are many ways and means by which farmers across the world conserve seeds and maintain the genetic purity for sustainable cropping (Winarto, 1997). Some of the methods in vogue among tribal communities are presented in the next subsections.

Indigenous Seed Technology

Farmers remove rogue plants at least 20 days before harvesting in order to avoid admixtures. Farmers claim that rogue plants mature first and

their culms colour (light yellow to pink and grey) is found to be different during weeding and harvesting periods. Although plant breeders suggest that to make genetic purity of a variety, it is necessary to do the rouging at the flowering stage, farmers' practice of rouging is scientifically rational and plant protectionists recognize that this technique helps in reducing pathogens and insect pests. Before sowing, farmers sieve rice seeds in order to separate the seeds of weeds. Since most of the weed seeds are smaller than rice seeds, they are filtered out in the sieves. By thrashing rice seeds manually, farmers claim that the plumule area of rice seeds is protected.

Through physical observations on the basis of phenotypic characters, farmers select/demarcate healthy plots for seed purposes. This is often done one month prior to harvesting. Healthy plots that are free from pests or disease attack are selected. Farmers also hold certain beliefs while picking the rice seed. They suggest that the seeds which are selected by hand and by women folk are more suitable for germination rather than the male folk hand selected seeds. The logic behind this is that, women hands are more frequent and expert than those of men and are therefore more appropriate for selecting the seeds that can be conserved for longer periods and maintain their genetic purity (Gupta et al., 1996).

Farmers Network for Seed Exchange

Tribal farmers still trust their own managed seeds rather than those supplied by private companies and the Seed Corporation. The farmers form an informal network wherein they visit each other's fields before harvest. They judge the quality of the seeds by observation. If they are satisfied, they enter into agreement to exchange seeds from each other. There are some large-scale farmers in the villages who raise one to two acres seed farms every season. Many small-scale and marginal farmers reported that these seed growers are local large scale *in-situ* conservers of quality varieties of rice. Clearly, farmer-to-farmer seed exchange technique can significantly help to ensure quality seed in risk prone environments and areas of poor socio-economic conditions.

Indigenous Methods of Sowing of Rice Seed

Observations reveal that the type of soil, rainfall pattern and variety of crop determine the methods of seed sowing. There are three popular methods of seed sowing/transplanting for the rice crop that are common among the tribal people:

Kharri Method

In the low land areas where water logging is the common problem (*Dhari* soil), to avoid the impact of heavy rains during the period of July and August, farmers broadcast a variety of rice seeds possessing early to medium maturing characteristics in dry land and pulverized soil. Generally, planking is avoided using this method. After the on-set of the first monsoon, the soil receiving the first precipitation drop and the seeds get germinated. Before the logging of the water, the crop is ready for harvest (70 days after sowing). This practice is recognized as rational by the agronomist and soil scientist for reasons of energy, time and moisture conservation as well as labour saving.

Lahee Method

The *Lahee* method of sowing the rice crop refers to when the germinated seeds are broadcasted in the well pulverized moist or the puddled soil. This practice is done in between 10 June to 15 July and is preferred in soils (*Tikara* soil) where water run-off is a major problem. Before broadcasting of the seed, about 20 *Paily* per acre (1 *Paily* = 15 kg.) rice seed is soaked in the water and kept over two days for premule initiation.

In the Southern part of Bastar district, the Halba tribes cover the paddy seeds by the moist jute bag, while in the Northern part of the district the Gond tribe do this by using the green leaves of *Saaz* tree (*Terminalia chibula*). The farmers perceive that the leaves act as catalytic agent for a rapid germination of the rice seed and increase percentage of germination. The practice was accepted by the majority of scientists interviewed to be scientific and rational. The Ethno-botanist explained that some active acids are found in the leaves of Saaz tree, which rapidly activate the germination process of rice seeds. After making the well-pulverized soil or the puddling of land, seeds are broadcasted and planking is avoided in order to save the radical and coleoptiles.

Indigenous Cropping systems

Indigenous Mixed Cropping

In this system of cropping, farmers sow more

than two crops at the same time to increase the diversification of crops in order to reduce risks resulting from crop failure. Farmers normally sow a mixture of legumes, cereals and oilseed crops with an objective to meet the protein, fat and carbohydrate requirements. Basically, in the *Marhan* soil, maize, cowpea, black gram, jowar with red gram and black gram are cultivated as carbohydrates and protein oriented crops. This system improves the soil fertility, assures the food supply and make available fodder for livestock. In the same agro-ecosystem, after harvesting the paddy crop, a mixture of wild domesticated vegetable plants like, *Chench and Jhirra bhajee (Ethnic vegetables)* in both *Rabi and Kharif season* are consumed because they are nutritious. This ensures food security especially of women farmers.

In irrigated farming situations, few farmers would plant wheat with mustard crops. In some areas, finger millets with black gram and red gram is the popular mixed cropping in vogue among the tribal community. While in the southern part of Bastar district, early maturing variety of paddy crop, maize, sorghum and red gram are planted to cope with the needs of a diversified food system. Scientists believe that this system increases crop turnover within multiple cropping systems because of the positive interactions between different plants species, more efficient use of solar radiation, reduction of auto-toxic effects of certain crops, more efficient use of soil moisture and a dense canopy that suppresses weeds and reduces erosion.

Utera Cropping System

Utera cropping literally refers to "sowing of the next crop seeds before harvesting 15 days of standing paddy crop in order to utilize moisture efficiently" under rainfed agro-ecosystem. *Utera* cropping is only adopted in *Rabi* season. This system helps farmers to use the available moisture in rainfed areas and diversify the next cropping system by incorporating two or three pulse and cereal crops to reduce crop failure risks. For a successful *Utera* cropping system, seeds of the local pea, linseed, local variety of black gram, and *lathirus (*lentil, *Lathyrus sativus)* are sown. In the paddy crop field, most of the paddy cropping area is done in a micro-environment by conserving water from natural resources. Just before the 15 days of harvesting of the paddy crop, the seeds of the above-mentioned crops are broadcasted.

The environmental and economic sustainability of the *Utera* cropping system is assured by compatible ecological conditions and harvesting more than one crop at a time, without applying additional external inputs. Due to the popularity and sustainability of this system, ICAR got inspiration from this practice and implemented the NATP project during 1999 in some of the other areas in the State (Dwivedi et al., 2002). The multidisciplinary scientific team has accepted that this practice is quiet scientific in terms of labour, energy, water availability, rainfall pattern, texture of soils and needs of the farmers under the rainfed agro-ecosystem.

Creating Micro-Environment for Cropping System

Farmers farming under rainfed situations create favourable micro-environments for diversification of their crops and sustainable use of natural resources (Chambers, 1990). The tribal farmers (resource-rich) are skilled in using artificial *Khanti* (trench) as well as natural *Khanti* for growing the late variety of paddy crop in *Kharif* season. The artificial technique of making trench is more popular among the Gond tribe while the natural *Khanti* is preferred by the Halba tribe. This is the best technique for growing rainfed wheat in the *Rabi season* under low moisture holding and light textured soil conditions. While in some areas, red gram with the finger millets is planted in the created micro-environment. The continuous wetness of the *Khanti* during the rainy season is the result of seepage of hilly areas and upper stream of soil which help moisture growth. The soil of *Khanti* is more fertile than normal land, facilitated by rain water, which comes with organic matter from forest and hills-tops. In *Rabi* season, just after harvesting the paddy crop, an early local variety of rainfed wheat, linseed, *lathyrus*, and pea growing under the created micro-environment is preferred. For Ecologists, this practice is most rational and is an efficient use of natural resources for sustainable agriculture (Chambers, 1990).

Adaptation of Micro-Farming Situations Based on Indigenous Varieties

The green revolution vastly increased the productivity of resource-rich farmers through improved varieties in India under irrigated

conditions, but it caused little change among the resource-poor farmers (Maurya, 1989). Due to the lack of appropriate varieties, resource-poor tribal farmers have developed and conserved location specific indigenous paddy varieties to cope with the changes in socio-cultural and environmental conditions and food security needs (Kaihura et al., 2003).

With the passage of time, they have changed their strategies for identifying the resources, agro-ecosystems and services responsible for sustainable rice production (Lightfoot et al., 2001). There are different micro-farming situations in which tribal communities practise their different location specific paddy rice varieties. With regard to paddy rice cultivation and conservation, farmers have classified three different micro-farming situations on the basis of soil, colour, depth, topography, crop, irrigation sources and overall problems (Table 1).

Local farmers have applied adaptive management strategies for the utilization and cultivation of indigenous rice-biodiversity for ensuring food security and sustainable livelihood. With reference to these four identified micro-farming situations, the following location specific indigenous paddy varieties were found for purposes of environmental conservation and food security. There are 26 indigenous paddy varieties, which are still prevalent in the study area (Table 2). All the identified varieties differ from each other on account of their phenotypic characteristics like root system, collar region, colour of leaf, over all plant and seed colour and their size. As indicated by yield potentiality, all the early indigenous varieties produce less yield than the late variety. Each variety has some specific genetic attributes like drought tolerance, insect pest and disease tolerance and tolerance against water lagged conditions which make it compatible for a particular microecosystem. These varieties are perceived by the local farmers to be sustainable in terms of growth, fodder quality, fodder yield, fodder quality test of rice, nutrient in food and nutritional value. The conservation of these reported varieties is practised more amongst the Halba. However, a few progressive Gond tribe are these days adopting improved and HYV paddy crop.

The varieties *Hardi Gati, Banse Bad, Vasta Bhog, Sapri, Gada Khutta, Dubraj* late, *Logti Machhi, Suriya, Khujj* late, *Skari, Asam churi* and *Madhuri* are grown only under micro MFS-1 and perform better. This result is in line with the findings reported by Brookfield (2001) that broadly speaking ago-biodiversity is composed of skillful selection of adaptive environments. The varieties *Lal Hazari, Lodiyari, Mancha, Vasta Bhog, Sapri Churi, Kanta Gurmatiya, Barai, Dubraj* early, *Kharela, Kalchar Sindursingar, Khujji* early, *Para* and *Lochai* are found to be best in their performance under MFS-2, which is comparatively inferior than MFS-1.

The biophysical indicators of MFS-3 reveal that this is a risk prone area and only *Lal Hazari, Lodiyari, Dubraj* early, *Para* and *Lochai* are

Table 1: Identified micro-farming situations (MFSs)* for the indigenous paddy varieties

Bio-physical indicators	*MFS-1*	*MFS-2*	*MFS-3*	*MFS-4*
Soil texture	Heavy textured (Dhari/Chikat)	Medium textured (Kachhar Mitti)	Light texture (Tickrai Mitti)	Very light (Marhan)
Soil colour	Black	Light black	Yellowish	Red
Depth	8-10’	6-8’	2-3’	0.5-1.5’
Topography	Flat to slight slope	Slight to moderate sloppy	Moderate to heavy sloppy	Highly sloppy
Irrigation	Nala	Unirrigated	Unirrigated	Unrrigated
Vegetation	Semar, Mango, *Mahua,* Tamarind, Saal and Arjun	*Mango, Mahua, Neem, Arjun*	*Mahua, Neem,* Tendu	*Kosum, Neem, Tendu*
Crop	Late tall variety of paddy	Medium period maturing variety of Paddy.	Early paddy, black gram, green gram and maize	Early paddy, black gram, green gram, Til, Jowar, *Mandiya*
Problem	Weeds, water logging	Soil erosion moisture stress	Soil erosion moisture stress, soil infertility	Soil erosion moisture stress soil infertility

**Among both the tribal community, the MFSss were identified with the help of focus group discussions (FGD) and finally on the basis of variations and commonness it has been pooled to make it common for all the selected villages.*

Table 2: Documented indigenous paddy varieties with their attributes and respective MFSs

Indigenous paddy varieties	*Attributes of the varieties*	*MFSs under which varieties are grown*	*Yield (in Qtl)/ Acre(0.4 ha= 1 acre)*
Hardi Gati	Tolerant to water logging and insect pests	MFS-1	10-12
Banse Bad	Tolerant to water logging and insect pests	MFS-1	13-14
Lal Hazari	Tolerant to drought and insect pests	MFS-2&3	8-9
Lodiyari	Tolerant to drought and insect pests	MFS-2,3&4	8-9
Mancha	Tolerant to drought and insect pests	MFS-2	10-12
Vasta Bhog	Tolerant to drought and insect pests	MFS-1&2	7-8
Saprichuri	Tolerant to drought and insect pests	MFS-2	8-9
Sapri	Tolerant to water logging and insect pests	MFS-1	8-10
Gada Khutta	Tolerant to water logging and insect pests	MFS-1	12-14
Kanta Gurmatiya	Tolerant to drought and insect pests	MFS-2	8-10
Gurmatiya	Tolerant to drought and insect pests	MFS-2	8-10
Barai	Tolerant to drought and insect pests	MFS-2	10-11
Dubraj Early	Tolerant to drought and insect pests	MFS-2,3&4	8-10
Dubraj late	Tolerant to water logging and insect pests	MFS-1	12-14
Kharela	Tolerant to drought and insect pests	MFS-2	7-8
Kalchar	Tolerant to drought and insect pests	MFS-2	7-8
Log Machhi	Tolerant to water logging and insect pests	MFS-1	10-12
Suriya	Tolerant to water logging and insect pests	MFS-1	14-15
Sindur singar	Tolerant to drought and insect pests	MFS-2	7-8
Khujje (early)	Tolerant to drought and insect pests	MFS-2	7-8
Khujje (Lal)	Tolerant to water logging and insect pests	MFS-1	8-10
Sakari	Tolerant to water logging and insect pests	MFS-1	10-12
Asam churi	Tolerant to water logging and insect pests	MFS-1	10-12
Para	Tolerant to drought and insect pests	MFS-2,3&4	7-8
Luchai	Tolerant to drought and insect pests	MFS-2,3&4	7-8
Madhuri	Tolerant to water logging and insect pests	MFS-1	10-12

varieties which are compatible with this agroecosystem. The drought tolerant nature, early maturity and dwarfness of these varieties make it possible to cope with moisture stress and risk prone conditions. In terms of drought tolerance, under the MFS-4 there are only four varieties, namely *Lodiyari, Dubraj* early, *Para and Lochai,* that can survive under highly sloppy, unirrigated light textured and little depth soils (0.5-1.5'). All the location specific paddy varieties are conserved and multiplied by the tribal people in each year according to their needs. This is the result of generations of learning, experimentation and innovation on the use and management of agro-biodiversity (Kothari, 1997; Singh, 2003c and Rerkasem, 2003). These varieties are the only means for the tribal people to get maximum production and manage the environment sustainably (Rolling and Engel, 1988).

The economic sustainability of these varieties is assured by its multipurpose use like foods, fodder (Singh, 2001) medicine, wines and other by-products. The documented varieties and their characteristics as reported by the farmers are confirmed by the plant specialists. These days, plant breeders of the State are giving due recognition to the folk varieties for conservation of indigenous paddy. The variations in attributes of these varieties are good source from a biodiversity point of view and for future crop and productivity improvements.

Indigenous Rice Pest Management Strategies

Some of the local practices are followed by local farmers for reducing the incidence of insect pests. Using the mechanical method, the adult insects/caterpillars are physically picked from the plants of infected fields and destroyed by burning and the resulting ash is broadcasted to control pest attack (Singh, 2003d). Although the percentage of this practice is small, about 4-5 per cent of whole community practice it, the *Halba and Gond* tribes believe that in this way they reduce the crop damage by insects. Pests are also managed by a cultural worship called *Hareli* in the northern part of the Bastar district, which is celebrated at the on-set of the monsoon. *Halba* and *Gond* tribes believe that by this worship they give due respect and recognition to God and nature to maintain the rain for their crops and control the multiplication of insect population. In the southern part of the district, this cultural occasion is celebrated by the name of *Hamush.*

During the process of worship in the standing crop, the green leaves and soft shrub of different plant materials like *Salphi*, *Bhelwa* (*Semicarpus anacardium* L. F.), *Tendu (Diospryos melanoxylon* Roxb.*)*, *Chhedawari*, *Stawar* (*Asparagus recemosus* Willd.) and *Karla* are spread randomly in the paddy fields. According to ethno-botanists' perception, most of the indigenous trees/herbs/ shrubs are rationally used. They have anti-fungal, anti-bacterial, and anti-insecticidal properties that check the attack of insect pests. When mixed with water, these materials create an eco-friendly defence mechanism that save paddy crops. This practice is eco-friendly, economically viable, socially justifiable and compatible to the farmers' socio-cultural environments. The other practices such as crop rotation, burning of crop residues, flooding and draining, and proper selection of planting dates were found to be some of the insects pest management practices in rice based cropping systems. Pimbert (1991) and Chambers (1990) also confirm the relevance of such practices in other parts of the world. These practices need to be incorporated in the package of practices after scientific refinement and validation (Sillitoe, 2001; Sibanda, 2001 and Gorjestani, 2003).

CONCLUSION AND POLICY IMPLICATIONS

From the foregoing interaction with the farmers, it can be concluded that they have experiential wisdom which they use to conserve and select location specific indigenous paddy varieties for obtaining sustainable yields. Poor socio-economic conditions and risk prone biophysical conditions of farming do not permit the adoption of high energy based farming technologies by the tribals. Considering the variability in bio-physical and socio-cultural conditions, few indigenous practices of rice crop management vary in degree between the Halba and Gond tribes. Most of the indigenous varieties are tolerant against disease and insect pest, and therefore help to reduce expenditure on farming and increase the benefit. These farming practices also provide opportunities to manage the gene flows between different varieties and to conserve the genes for future crop improvement. Indigenous methods of selecting and conserving local paddy varieties, which include the selection of plants/trees/shrubs and cultural practices, seed selection and pre-servation, location specific packages, cropping systems and insect pest management, are significant contributions towards sustainable agriculture (Sibanda, 1998).

The protection of such indigenous knowledge could also help in raising its validity in the development arena. The search for sustainable agricultural models for the tribal communities should focus on effectively combining elements of both traditional and scientific farming systems (Brush, 1990; Sillitoe, 2000 and Prakash, 2003). Traditional patterns and practices encompass mechanisms to stabilize production in a risk-prone environment without external subsidies and to limit environmental degradation. Such stabilizing qualities of traditional agriculture must be supported and complemented by agro-ecological practices that enhance the soil, water, and germplasm conservation potential of traditional technologies. That also provides diversification guidelines on how to assemble functional biodiversity.

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ABSTRACT Farmers in developing societies have evolved location specific local knowledge and gained through close interaction within natural and physical environments and cultural adaptation, which are recognized now to be more eco-friendly and sustainable. Up to a 1980s, these farmers were considered laggards. These days however, the increasing attention and scientific research have made it possible to recognize such farmers as innovators based on their unique practices in the field of sustainable agriculture. To examine the importance of such farmers' knowledge and role in sustainable agriculture, its study was conducted in purposively selected villages of *Gond* and *Halba* tribes in the southern part of Bastar district, Chhatisgarh, India. Indigenous rice crop management under rainfed agroecosystem was the focus. A combination of methods including Participatory Rural Appraisal (PRA- participant observation, group discussions, distant learning and semi-structural interview were used to collect the data. A group of experienced scientists from different disciplines of agricultural science were chosen to capture their perception on farmers' practices. The study demonstrate that the perception of agricultural scientists indicates that most of the documented local practices of rice crop management by tribal people are rational and sustainable.

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