37. ***Myda* and *Jhola* rice cultivation systems, Koraput:** Responding to the topographical and ecological diversity of the Koraput region, the early settlers of the region belonging to Austric-Asian races evolved systems, like *myda* cultivation, practiced by Gadabas, involved with growing of two varieties of rice together in the same field during *kharif* season in plateau. Whereas, Saoras evolved the *Jhola* cultivation system in highland landscapes with terraces prepared with support of boulder walls. The terraces on uplands hillside sustained by rough stone packed revetments are wonderful eye-catching scenes, reflecting ancient nature of the system.

38. **Semi-nomadic pastoral farming and dryland agriculture system, South-Central Eastern Ghats**: The dry ecological conditions and lack of perennial sources of water with rich livestock diversity and land resources like savannah grassland and thorny thickets for feeding animal, has resulted in evolution of semi-nomadic pastoral farming system. Its practice from ancient times is indicated by archaeological ash mounds of cattle dung discovered at Neolithic sites in South India reflects the presence of pastoralist camps (Allchin, 1963). The animal and plant remain found at the excavated sites suggest the dominant role of domesticated cattle, with supporting rainfed agriculture of crops like millets, beans, common pea, horse gram, black gram, and rice, particularly in Rayalaseema and parts of Nellore and Prakasam, Bellary, Richur and Kolar. This has resulted in the evolution of many indigenous hardy breeds of cattle (*Ongole*) and sheep; and drought-resistant cultigens in millets and pulses.

39. ***Cheruvus* (reservoir) system, Chittoor and Kadapa:** In Chittoor and Kadapa districts of South-Central Eastern Ghats, to overcome the scarcity of water due to low rainfall, absence of perennial rivers, and unpredictable weather, a network of water tanks and reservoirs (*cheruvus*) were developed to store runoff water. *Cheruvus* are embankments that are fitted with *thoomu* (sluices), an artificial passage for water fitted with a valve or gate for stopping/regulating the flow; *alugu* or *marva* or *kalju* (flood weir)- a barrier across the passage is designed to alter the flow; and *kalava* (canal) are channel for water discharge.

40. **Grand *Anicuts* system, Cauvery Basin:** It involves building of stone embankment named *Kallanai* dams, with network of irrigation canals (*Vira Pandyan-Kal*) and water reservoirs (*Vallabha Pereri*) for extended irrigation and supply of drinking water. The Cauvery River is interrupted by twelve dams (‘*anicuts*’)- *Grand Anicut*, and the water is diverted through artificial channels for irrigation and for drinking. The Grand Anicut is originally believed to have been built in the mid to late Chola times and was later rebuilt by the British.

41. ***Korangadu* grazing system, Tamil Nadu:** *Korangadu* is a traditional grazing grassland in the semi-arid tracts of the districts of Erode, Karur, and Dindigul, Tamil Nadu. It consists of paddocks (small enclosed fields) having combination of grasses, legumes and trees for grazing. They are fenced with live thorny shrubs of *mullukiluvai* [*Commiphora berryi* (Arn.) Engl.], a thorny drought-resistant shrub. They are used as sustainable support for livestock rearing and as breeding tract, called *Kangayam* of cattle, which supply good quality plough and draft bullocks, local buffaloes and native breeds of sheep (*Mayilambadi* breed) and goats. This unique system displays indigenous knowledge regarding the management and conservation of unique animal breeds, their upkeep, rearing and breeding along with conservation of grasslands.

42. ***Catamaran* coastal fishing system, coastal Tamil Nadu:** It is a sustainable eco-friendly traditional fishing system. The *Catamaran* is a type of multihulled boat or ship consisting of two hulls (*vakas*), joined by some structure, the most basic being a frame (*akas*). It has evolved into a light watercraft called *Kattumaram* in Tamil. The word *kattu* means 'tie', and *maram* is the 'wood tree', thus, *Kattumaran* simply means 'tying two trees together'. It was invented by the *Parava's*, an ancient coastal aristocratic fishing community of southern India, Tamil Nadu.

43. ***Kohli tanks, Bhanadara* (check dams) and *Phad* system, Tapti River Basin:** In semi-arid tropic areas of north-western Maharashtra, locals have developed traditional water harvesting systems. The *kohli tank* system, built in Bhandara district, comprises several water tanks of different sizes used for irrigation of sugarcane and rice, often with the provision of bringing water to village farms from river. The check dams called *Bhanadaras* are built across rivers, raising the water level and forcing it to flow into the channels. They are also used to impound water from reservoirs. Villagers or individuals building such structures receive rent-free land in return. The *phad* is an improvised community-managed irrigation system. It starts with a *bhanadara* and is branched out into *kalvas* (canals) with a discharge capacity of about 450 litres per second. The lengths of these *kalvas* vary from 2 to 12 km. From *kalvas, charis* (distributaries) are built for carrying/feeding water to different areas of the *phad. Phad sarangs* (field channels) channelize the water to individual fields. The *sandams* (escapes) are built along these structures to drain away the excess water.

44. ***Daarche Paani* system, Konkan:** Recognizing water scarcity during summer and to ensure water availability throughout the year, community-managed water harvesting systems have been developed by locals in Konkan region. *Daarche Paani* involves man-made tanks, channels, and falls on small flat plateau called '*Sadaa*' supplying water to villages and for irrigation of plantations. *Daarche Paani* consists of seven tanks, each built in stone at different levels. The first tank receives continuous freshwater from an underground spring and is called *Devache Taake* ('Tank of the Gods'). This overflows through a channel to a drinking water tank, from where the women collect water. Washing and bathing near these tanks is prohibited. It is cleaned daily by the first and the last user. Then, water flows to a bigger tank for the cattle with gently sloping margins. Margins of tanks are interesting to see, allowing small animals as well as birds to use, without the perennial danger of a thirsty one falling in and drowning. Next in the hierarchy are the tanks for cleaning and bathing, which have specially built stone platforms. These tanks converge into a channel, which flows down to irrigate indigenous plantations (areca nut and pepper) in downstream. Finally, small spring eventually joins the river and meets the Vashishthi estuary (Dandekar, 2010).

45. ***Ulkatni* and *Awatni* rice cultivation system, Konkan:** *Ulkatni* and *Awatni* are two local practices followed in the *Khar* (salty) lands of Thane and Raigad districts of Maharashtra. In *Ulkatni*, the clods are turned upside down with the help of a crowbar in the months of April-May. Whereas, *Awatni* is the practice of putting the rice seedlings in the field along with the mud ball from the seedbed (transplantation) after ploughing. It was observed that both the methods of preparatory tillage were effective. Hence, instead of *Ulkatni*, which was done manually, ploughing could be done after the harvest of *kharif* rice in reclaimed *Khar* lands. *Awatni* was significantly superior to the regular practice of transplanting, provided the plant population is maintained. Surface (superficial) planting in *Awatni* avoids contact of the

tender seedlings with the salty portion of the soil, avoiding seedling mortality. This practice has generated large genetic diversity.

46. **Mixed poly-cropping system, Northern Western Ghats:** *Warli* community living in the Warli Hills of Maharashtra follow complex multiple mixed cropping of annuals and perennial crops, making optimum use of the available resources. Based on multiline concept, it includes cultivation of multiple varieties of a crop fulfilling different requirements and maturity duration, providing insurance against crop failures. Further exploiting tropical climate with high rainfall, it also includes cropping of horticultural crops facilitating effective and efficient land use, with more crop per unit area and per drop, providing greater income. Several mixed cropping systems have evolved in the region, including both rainfed and irrigated cereals, pulses, vegetables, fruit and plantation crops, such as spices.

47. ***Pokkali*' and '*Kaipad*', rice cultivation systems, Malabar region:** Under these systems, the excess water caused by excessive rains and regular action of sea waves and shore currents in the coastal areas and in the areas below sea level, has been harmoniously and profitably managed by the local populations with ingenuity. It includes, practice of rice cultivation in waterlogged areas of southern coastal Kerala (Alappuzha), called '*Pokkali*'. It is a unique cultivation system of salinity-tolerant rice varieties cultivated in an organic way in the waterlogged coastal regions. It has been further improved with integrated rice–shrimp/prawn farming. One rice crop followed by shrimp/prawn capture provides a substantial subsidiary income to the farmer (Jayan and Sathyanathan, 2010). This system is also practiced in Thrissur and Ernakulam districts.

    In Kannur district of North Kerala, a similar system called '*Kaipad*' is practiced with the rich biodiversity of flora and fauna, organically rich soil, mangroves, and migratory birds. It differs from '*Pokkali*' in the way it is carried out, which is purely natural way relying on the monsoon and the sea tides. Besides, it has its own salinity-tolerant landraces of rice and high-yielding rice varieties (Vanaja, 2013). *Kaipad* is also practiced in Kasaragod and Kozhikode. These systems together have been notified by FAO as GIAHS, the Kuttanad rice cultivation below sea level (www.fao.org/giahs/giahsaroundtheworld/designated-sites/.../kuttanad...system/en/).

48. **Homestead polyculture farming systems, Malabar region:** In hilly and mid land zones of Southern Western Ghats, the system of homestead farming is practiced, growing of a wide variety of crops. Farmers choose their crop combinations and livestock or fish farming as per the prevailing conditions. Several intercrops are raised, resulting in a multi-story cropping pattern with canopy stratification. Perennial tree crops such as coconut, areca nut, jack fruit, mango, cashew, tamarind, and forest tree species occupy the upper layer; pepper, clove, nutmeg, cinnamon, cocoa, etc., occupy the second layer; banana, cassava, yam, cocoyam, etc., occupy the third layer; and ginger, turmeric, pineapple, vegetables, grain legumes, and guinea grass occupy the ground layer. This approach nearly attains the tropical rainforest structure with wide species diversity, which is its science base and might have stimulated indigenous farmers for adoption involving economic plant species. It often includes livestock.

In addition, there are heritage systems related with economic exploitation and management/conservation of biological diversity while supporting agriculture. They either provide further opportunities for expansion of agriculture with domestication/cultivation of more

economically important plants and rearing of animal species or indirectly support agriculture with interactions of natural resources. For example, the health/medicinal systems (*Sowa-Rigpa*or *Amchi*, *Ayurveda*, *Sidha*, etc.) based on medicinal/nutritional properties of plants, mostly exploited from the nature; sacred groves (Meghalaya, *Deogudi* of Bastar, *Deva Vanas*, North-western Deccan Plateau; *Devarai*, *Devarakavu*, *Kan* with *Kalkai* (deity), Konkan; and *Kavu* or *Serpa Kavu*, southern Western Ghats) facilitating conservation of natural resources (water) and species diversity, particularly wild relatives of crop species. Most of these Agricultural Heritage Systems (AHS) have been briefly described by Singh (2015), as components of the various National Agricultural Biodiversity Heritage Sites. The table 1 lists these AHS, providing a bird's eye-view of their location, significance; and scientific principles involved.

FAO Initiative

To safeguard and support the world's important AHS, FAO initiated a project for identification and dynamic conservation of Globally Important Agricultural Heritage Systems (GIAHS) in 2002 (GIAHS, 2002). This GIAHS initiative, now referred as GIAHS Program, under FAO promotes public understanding and awareness development about AHS, and their national and international recognition. To date FAO has identified 36 sites in 15 countries after scientific evaluation.

Recognizing the value of these systems in conservation of renewable natural resources and sustainable agriculture in an environment friendly manner, and for protection of indigenous technical knowledge (ITK), this program envisages looking after and protection of these systems to safeguard the social, cultural, economic and environmental goods and services, which these systems have been providing to farmers families, smallholders, indigenous peoples and local communities. The program fosters an integrated approach, combining conservation of natural resources, sustainable agriculture and rural development. It can facilitate the potential replication or improvisation of agricultural systems, in other parts of the world with similar ecologies and landscapes. The present overview attempts to identify such systems spread over the different agroecological zones of India (Sehgal *et al*., 1992), bringing them into scientific domain for further investigation, leading to their characterization, evaluation, and assessment of potential value from scientific knowledge and practical application point of view, particularly in management of natural resources and sustain/improve agriculture in difficult/extreme ecologies of the world, taking advantage of FAO initiative.

FAO initiative has been providing systematic support for protection through preservation and adaptive management of such AHS at-

- Global level, through their identification and due recognition
- Encouraging the national programs to create policies for support and safe guard the significantly important AHS
- Learning lessons by working directly with custodian communities on accrued benefits and on the management and dynamics of conservation of their agricultural heritage systems and sharing them with others, based on fair and equitable sharing of commercial benefits accrued, if any.

Possible criteria for identification of important agricultural heritage systems

To strengthen FAO efforts, it is suggested to adopt a participatory methodology for identification of AHS involving both the farmers and agricultural scientists representing concerned disciplines,

as the scientific perceptions may vary. Following general indices can be used for identification of the prospective agricultural heritage system:

- The system should be rich in agricultural biodiversity, contributing to food and nutritional security and/or livelihood support to farming communities.
- It should be associated with biodiversity and ecosystem functions, with rich and unique agricultural biodiversity and genetic resources (species, landraces, farmers varieties, breeds and strain, etc.) as well as other biodiversity components supporting agroecosystems, such as wild relatives, pollinators and the wild life associated with agricultural and landscape (using them for economic benefits and/or overcoming constraints).
- It should be preserving valuable knowledge about local natural resources, indigenous technologies and management systems of natural resources, and the landscape to which it is habitat to.
- Should be rich in cultural and social values, through cosmovision, ethics and ideals (laws) and agricultural practices associated with environment, and agricultural calendar/cycle, festivals, rituals, and system of information/knowledge exchange.
- Landscape and other features resulting from human intervention/management, facilitating land and water management (e.g. Cauvery basin), contributing to landscape and overall development.
- Finally, the degree of dependence of the local community upon its traditional system(s), because of their adaptations to stress, environment factors- both biotic and abiotic, minimizing the inherent risks associated with farming.

Possible values of such systems

In terms of large-scale production, the traditional agricultural heritage systems are less competitive in products, yield and prices. Nevertheless, they have other irreplaceable functions and values, which together make them as serious alternative options/technologies for consideration towards improvisation of available technologies and products, and in mediating the adverse consequences of climatic change, facilitating environment friendly modern development. They are:

- Rich in agricultural biodiversity in terms of products (landraces, farmers varieties) and indigenous technologies/systems for effective management and conservation of natural [both edaphic, including water (upland, midland, lowland), landscape, field, and biologicals- including forest, species diversity (aquatic and terrestrial)] and man-made resources
- Possesses distinctive features of cultural, family, social, historical nature and respect for their natural surroundings and habitats
- Many are often geographically isolated to extreme climatic conditions, supporting fragile ecosystems and agriculture, based on limited natural resources (e.g. cold arid regions of Ladakh and surrounding areas in Western Himalayas and hot and arid Thar desert of Rajasthan)
- Most traditional system support conservation and sustainable use of biodiversity and genetic resources for food and agriculture
- Most provide ecosystem services for sustainability of nature and environment

- Promote conservation and sustainable agriculture based on ingenious practices, evolved over local natural resources (avoiding dependency), and provide lessons/technologies for further use, elsewhere
- Most traditional heritage system have potential for integration with modern technologies, which may help indigenous communities to make full and better use of their diverse resources
- They can serve *in situ* learning laboratories for demonstration of new innovative ways, facilitating sustainable agriculture and conservation of nature's bounty

Need for their characterization, evaluation and protection

All the traditional systems may not be dynamic and of the same value, either economically or for sustainability to suite the changing climatic conditions, socioeconomic development and market forces. Therefore, they need to be characterized and evaluated for assessment of their potential value. The unique AHS adapted to wide agroclimatic ranges need to be identified based on the indices discussed above and brought into scientific domain as additional resource of alternative knowledge/technique for development of more innovative agricultural technologies with a mix of components of traditional agricultural systems and the modern agricultural technologies. For example, integrated pest management systems, including both biological and chemical control, and recombinant DNA technology incorporating alien natural genes/alleles from diverse sources into locally well adapted products (varieties, breeds, etc.). This approach shall stimulate research and development of dynamic conservation practices with appropriate balance between conservation, use of modern technologies and socio-economic development.

Characterization and evaluation are also needed, because of the present scenario of Intellectual Property Rights (IPR) and access and benefit sharing (ABS) mechanism evolved as per the provisions of Convention on Biological Diversity (CBD), ensuring protection of farmers and communities rights over traditional knowledge and products, and providing fair and equitable sharing of benefit(s) accrued from their use.

Lastly, traditional heritage systems need characterization and evaluation to enable protection of important ones, before they are lost. As most are under threat because of intensification of modern agriculture with new technologies and products and following other reasons-

- Most heritage systems are being threatened, because of the population pressure, social, cultural and economic changes that are occurring to meet human and market needs without bothering about their negative impact, particularly on environment and climate.
- Accelerated urbanization and infrastructure development is adversely affecting the biodiversity in general and agrobiodiversity in particularly with drastic changes in land-use pattern causing genetic erosion.
- Modernization in general and in agriculture, neglecting the traditionally diverse heritage systems evolved over time in eco-friendly manner. In this process a significant amount of traditional knowledge is being lost, needing documentation/protection.
- Reduced local community/farmers participation in planning and decision-making for the development of the area and imposition of alien ideas to obtain greater economic yield, eroding these systems and their products.

- Inappropriate alien policies, legal and incentive framework evolved to support various initiatives, such as forest conservation and biodiversity, and water management systems (modern dams) are also putting a significant pressure on traditional heritage systems.

Promotion and utilization

Upon evaluation and assessment of potential value, the significantly important agricultural heritage systems need to be protected, promoted and effectively utilized following diverse strategies. They may be registered/notified with appropriate agencies, along with the registration of their products (varieties, breeds, by-products, etc.) under various national and international legislations. They may be promoted with branding and encouraged with payment of incentives/subsidies for adoption towards an environmentally friendly, and/or organic agriculture and for promotion of recycling of crop residue systems with value addition, contributing to environmental protection. Because of being labour intensive, they may provide greater employment opportunities to locals and economic development through programs, such as Agritourism, Ecotourism, Traditional Cultural tourism, etc. These programs should be evaluated following various strategies (feedback) at regular intervals to keep them updated through improvisation and dynamic changes.

Epilogue

The intensification of modern agriculture to meet the food and nutritional requirements of ever-growing global population is adversely affecting the eco-friendly traditional agricultural heritage systems, which have components both for conservation of natural resources and for sustainability of agriculture. Yield gains of modern agriculture has been threatening to the extent of extinction of traditional agriculture systems, leading to loss of knowledge about the science base of such systems and the gene pool/genetic diversity. They also need protection as per the provisions of CBD, to ensure protection of Indigenous Technological Knowledge (ITK) and the genetic resources evolved by generations of farmers to ascertain facilitated access and fair and equitable benefit sharing on gains accrued from their commercial use. Therefore, there is a need to identify the AHS globally, particularly in the developing world, which is still not overpowered by the modern agriculture. Scientific characterization, concentrating on interaction between companion species of agroecosystem, their documentation, and evaluation to assess the potential value is the need of the hour. This shall result in notification of potentially valuable agriculture heritage systems, development awareness regarding their value, need for their protection and promotion for use in similar ecologies, particularly the extreme ecologies and developing economies. If this is achieved, as FAO initiative envisages in its program, these AHS can be source of scientific knowledge and genetic material for use and development of innovative technologies and products based on combination of both traditional (AHS) and modern agriculture, overcoming the challenges of changing climatic scenario and those of 21st-century. The present article discusses the criteria and methodology that can be used for identification, characterization, evaluation, protection and promotion of an AHS or its science base in overall development. The article lists 48 prospective AHS spread over the different agroecological zones of India or replicated (science base) within the subcontinent with brief description that can be the basis for their in-depth studies and use. Considering that out of the 50 GIAHS announced by the FAO by April 2018 only three are from India, the authors also take this opportunity to appeal to the national project funding agencies and the implementing institutions and research scholars to accord priority to studies on further characterization and validation of the proposed 48 Indian

agricultural heritage systems to get some of them upgraded for their recognition by the FAO at the global level.

Nevertheless, as a word of caution, the authors would like to suggest that while identifying and assessing the potential value of an AHS, the usefulness of a system and the technology integral to it should not be decided by the old or new, but by its appropriateness. Also, the efforts should avoid putting the traditional against modern, but to put both together in a way to improve sustainable food production globally.

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Table 1 Prospective Indian Agricultural Heritage Systems of significance

S. No	Prospective Agricultural Heritage Systems	Science base, salient features and potential value	Area of practice
1.	Traditional land claiming system for agriculture	Ecological succession used by channelizing sedimented water from river/streams into freshly stone built terraced field, followed by natural plant succession and cultivation	Cold arid region of Leh to Nubra valley and Gilgit
2.	High altitude nomadic agriculture of tribes	High altitude grazing by turn leaving close pastures for winter (community practice)	Upper limits of western Himalayas, tribe *Changpa*'s
3	Terrace cultivation of paddy in valleys	Rice (including aromatic) cultivation on terraced lands, recycling crop residue for sustainability of soil fertility	Himachal Pradesh and Uttarakhand, Western Himalaya
4	Crop rotation and intercropping system	Crop rotation and intercropping harnessing benefit of interactions & residue in diverse micro ecologies- *Baranaja, Navadanya*	Uttarakhand, Western Himalaya
5	*Kuls* irrigation system	Surface harvesting of water by channelizing natural flowing stream from mountains to field	Himachal Pradesh, and Uttarakhand, Western Himalaya
6	Alpine semi-nomadic agro-pastoral system	Distant grazing by taking herds to long distance pastures by turn, leaving children, women and elderly back, tending remaining livestock. A family practices.	Tawang, Arunachal Pradesh, Eastern Himalaya, tribe- *Monpa* pastoralists
7	*Apatani*'s wet-rice cultivation	Based on effective water and energy use and conservation of soil fertility by recycling of crop residues, organic wastes, dung, achieving maximum output/input ratio	Arunachal Pradesh, Eastern Himalayas, tribe- *Apatani*
8	Agroforestry system involving cardamom and horticulture crops	Large cardamom or horticultural crops plantation beneath forest cover and on marginal lands	Sikkim
9.	*Rice-fish* cultivation in rain-fed lowland	Taking advantage of excessive flooding during monsoon in lowland floodplains, cultivating rice and fish	Brahmaputra Valley
10	Sericulture system	Exploiting local host plants to rear silkworm, *Antheraea assamensis* and *Philosamia rinini* producing *Muga* and	Assam Hills

		Eri silk respectively	
11	*Jhum* or slash-and-burn cultivation system	Primitive agriculture practiced on plots cleared after slashing and burning the vegetation and cultivating economic plants	Meghalaya, Nagaland tribe- *Angami*, Koraput and Konkan
12	Drip irrigation using bamboo pipes	Using bamboo pipes, trapping stream and spring-water to irrigate plantations.	Khasi, Jaintia and Garo Hills, tribe- Austro-Asiatic
13	*Panikehti* Rice Cultivation	Carrying of water from stream or torrent to terraces of rice fields in controlled manner, restricting soil erosion	District Phek, Nagaland, Naga tribes
14	*Zabo* system of composite farming system	Impounding of water at various levels, to practice composite community farming with a combination of forestry, livestock, irrigating rice fields and fisheries	District Phek, Nagaland, Naga tribes
15	*Alder* (*Alnus nepalensis*) agroforestry system	Planting of non-leguminous alder trees to enhance the soil fertility with nitrogen and other nutrients	Nagaland, Naga tribes
16	Water conservation and irrigation systems with *Tankas*, *Vav*, *Khadins*	Use of *tankas* (underground tanks), *vav* (step-wells) and *khadins* (impounded runoff water) for drinking and irrigation	Western arid zone (Bikaner, Jodhpur) and Gujarat; Paliwal community
17	Arid agroforestry system	Field planting of multipurpose trees, *Khejri* (*Prosopis cineraria)* and *Marwar* teak (*Tecomella undulata*)	Western arid and Central Rajasthan
18	Nomadic livestock rearing and breeding system	Development of resilient indigenous breeds of cattle, sheep, camel, etc., and their maintenance within restricted social groups of nomadic tribes	Western arid and semi-arid zone of Rajasthan and Gujarat, tribes, *Raika*/ *Rabaris*, *Maldharis*
19	*Pat* rainwater harvesting system	Diverting water from swift-flowing hill streams into fields via irrigation channels, *pats*, *nullahs*. A community effort.	District Jhabua, Malwa Plateau, Madhya Pradesh
20	*Durum* wheat cultivation system	Exploiting unique climatic conditions to support production of non-mottled, lustrous and bold grain of *durum* wheat	Malwa Plateau, Madhya Pradesh
21	Dryland agriculture, semi-nomadic animal husbandry,	Dryland farming with cash crops suited to semi-arid conditions, and animal	Semi-arid region of Kathiawar peninsula,

	and dairy farming system	husbandry exploiting rich diversity of local breeds of nomadic breeders, facilitating dairy industry	animal breeding tribe, *Rabaris Maldharis*
22	*Chandeli*-ponds for surface-water conservation and irrigation	Exploiting sloping topography to build embankment in watershed areas for trapping of water, in structures like lakes or surface-reservoirs	Semi-arid districts, Chhatarpur, Tikamgarh, Bundelkhand; communities *Chandels*, *Bundelas*
23	'*Zaid*'' 3rd crop cultivation system on residual moisture of river beds	Taking advantages of residual water of river beds, raising of 3rd crop of melons and vegetables	Along Yamuna River in Bundelkhand
24	*Gwari* pasturelands and *Annapratha* (open/stray grazing) system	Grazing on pasturelands and open/stray grazing supporting livestock	Plateau and hilly areas of Bundelkhand
25	*Beushining* rice cultivation system	Ploughing 50 cm apart after 25-30 days of sowing to improve crop-growth due to improved soil aeration and weeding	Rainfed and upland ecosystems of Upper Gangetic Plains
26	System of crop residue use as fodder	Use of crops residue (wheat straw, pulse peel, oilcake), as fodder, ensuring round the year feed for livestock and additional income	Upper and Middle Gangetic Plains
27	*Boro* rice cultivation	Cultivation of rice in waterlogged, low-lying or medium lands with or without irrigation.	Primarily in Middle and Low Gangetic Plains
28	Aquatic *makhana* (gorgon nut) cultivation	Cultivation of *makhana* (*Euryale ferox*), an aquatic weed in the shallow water bodies	Ponds of Bihar region of Middle Gangetic Plains
29	Pisciculture-fish culture in ponds	Fish culture, primarily in ponds around villages, and water-logged paddy fields	Middle and Low Gangetic Plain
30	*Pynes* and *aahar* irrigation system	Fetching water from river, stored in ponds (*aahar*) and then taken to field by nullahs (*pynes*). *Aahar* bed are used for *rabi* crop	Middle Gangetic Plains
31	Cultivation of water-loving Jute and allied fibres	Cultivation of water loving to jute & allied fibres in three delta areas of Bengal	Bengal delta region
32	*Paira* cropping system	No tillage cultivation by relay cropping through broadcast method in standing crop of lowland rice before its harvest	Tribal communities of Chota Nagpur plateau
33	Sericulture-for *Tasar* silk production	Rearing and breeding of moth/silkworm on *Terminalia arjuna*	Tribal communities of Chota Nagpur

		(*Arjuna*) and *T. tomentosa* (*Asan*), the host plants to produces cocoon	
34	Rearing of *lakh* or lac insects for the lac industry	*Laccifer lacca* (Kerr) is reared on the leaves of *Acacia* and *Ficus* spp., which deposits sticky, resinous secretion of the insect	Tribal communities of Chota Nagpur
35	Rice cultivation of Bastar and adjacent areas	Cultivation of diverse rice varieties under terrestrial heterogeneity and application of differential selection pressures of local communities	Chhattisgarh, local tribes and communities
36	Exploiting ecological (altitude), and plant diversity for domestication and creation of genetic diversity	Cultivation of rice in heterogenic altitude and wide range of agroecosystems, resulting in generation, maintenance/conservation of varietal diversity.	Jeypore tract of Koraput bordering Bastar-Austro-Asiatic tribes
37	*Myda* and *Jhola* rice cultivation systems	Using multiline concept, cultivation of two varieties of rice together in *kharif* on plateau (*Gadabas*), and terrace (*Jhola*) cultivation on hill sides (*Saoras*),	Koraput, tribes-*Gadabas*, *Saoras*
38	Semi-nomadic pastoral farming and dryland agriculture	Interacting with dry condition, land, phyto-resources and livestock diversity, domesticated and bred hardy breeds of cattle (*Ongole*), sheep, etc., and drought-resistant supportive millets and pulses	Rayalaseema, parts of Nellore, Prakasam, Bellary, Raichur and Kolar of South-Central Region of Eastern Ghats
39	*Cheruvus* (reservoir) system	Overcoming water scarcity by storing runoff water in a network of water tanks and reservoirs built by embankments	Chittoor and Kadapa district of South-Central Eastern Ghats
40	Grand *Anicuts* (dams) system or river management	Building of stone embanked *Kallanai* dams and a network of irrigation canals over course of river for extended irrigation and drinking water	Course of Cauvery river basin
41	*Korangadu* grazing system	Enclosing fields having combination of grasses, legumes and trees for grazing and breeding with fencing of thorny shrubs	Semi-arid areas of Tamil Nadu
42	*Catamaran* coastal fishing system	Use of a multihulled boat or ship (*Catamaran*) for sustainable eco-friendly fishing. This watercraft is called *Kattumaram* in Tamil	Coastal areas of Tamil Nadu

43	*Kohli tanks, Bhanadara* (check dams) and *Phad* system	Community-managed irrigation systems with tanks, *bhanadaras* (check dams) built across rivers, raising water level and taking it to fields by canals (*kalvas*)	Bhandara district and Tapti River Basin
44	*Daarche Paani* system	Community-managed water harvesting systems with tanks, channels, and falls on small flat plateau called '*Sadaa*', supplying water to villages and fields for irrigation	Konkan Region
45	*Ulkatni* and *Awatni* rice cultivation system	Practice followed in salty soil, where the clods are turned upside down before sowing in *Ulkatni*, while in *Awatni* after ploughing, rice seedlings are put along with the mud in the field to avoid contact with salt contents	Thane and Raigad districts of Konkan Maharashtra
46	Mixed poly-cropping system	Practice of multiple mixed cropping, including multiline and diverse rainfed and irrigated fruit and plantation crops with cereals, pulses, vegetable, spices, etc.	*Warli* tribe of Warli Hills Maharashtra, northern Western Ghats
47	*Pokkali*' and '*kaipad*', rice cultivation systems	Cultivation of salinity-tolerant rice varieties below sea level or under excessive flood waters caused by sea waves, through network of backwaters or eco-friendly practices	Southern coast of Kuttanad, Alappuzha (*Pokkali*); North Kerala-Kasaragod, Kozhikode, and Kannur (*kaipad*)
48	Homestead polyculture farming systems	Multi-storeyed intercropping like tropical rainforests with a range of crops (trees to basal herbs) in backyard gardens, often combined with livestock	Malabar region of southern Western Ghats