GIDR WORKING PAPER SERIES
No. 240 : January 2017

GIs for Protecting Agro-Biodiversity and Promoting Rural Livelihoods: Status, Strategies and Way Forward

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Working Paper No. 240

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January 2017

Gujarat Institute of Development Research
Ahmedabad

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Working Paper No. 121 onwards can be downloaded from the site

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First Published January 2017
ISBN 81-89023-96-9
Price Rs. 100

Abstract

One of the eight primary centers of origin of cultivated plants, India has about 379 closely related wild species including rice, pulses, millets, vegetables, fruits and fiber plants. Such diverse agro-biodiversity is increasingly threatened by vagaries of weather and acquisition of agricultural land for industrialization and urbanization. This is reflected, for instance, in the reducing number of food grain varieties and cultivators in different parts of the country. In this paper, the relevance of Geographical Indications (GI), as an important instrument to protect agro-biodiversity is attempted at. GI recognizes the link between the geographical region and product by highlighting any uniqueness of the product like fragrance, taste, specific use that is derived from the geographical link. Till June 2016, 78 agricultural products from different parts of India have been protected under GI which includes food grains, pulses and condiments. Many of the GI protected products (except those under plantation) are grown in small areas by a few farmers and face threat of extinction due to fluctuating market and non-cultivation by farmers. Such extinction indicates a two-fold impact on livelihood security and agro biodiversity– (a) possible vulnerability in livelihood due to change of cropping pattern/leaving agriculture and (b) loss of diversity due to discontinuation of cultivation. GIs could be used to market such products by bridging asymmetry of information between sellers and buyers and thereby revive the farmers' interest and help address the threat to biodiversity.

Key words: Intellectual Property; Geographical Indication; Agro-biodiversity; Agriculture Markets

JEL Classification: Q57, Q13, O34.

Acknowledgements

An earlier version of this paper was presented at the *International Seminar on Poverty, Environment and Sustainable Development Goals* organized by the Centre for Ecological Economics and Natural Resources and held at Institute for Social and Economic Change, Bangalore during December 8&9, 2016. We are thankful to Professors P. G. Chengappa and Sunil Nautiyal for their comments on the paper and the observations from the other participants in the seminar. We are grateful to Professor Mruthyunjaya Hegde, who kindly read the paper and gave very useful comments which helped in improving the clarity of the paper. Ms. Aarti Oza rendered valuable research assistance. Shortcomings in the paper rest with us.

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1. Introduction

Agro biodiversity refers to the variety and variability of animals, plants and micro-organisms that are used directly or indirectly for food and agriculture including crops, livestock, forestry and fisheries. India is one of the eight primary centers of origin of cultivated plants with about 379 closely related wild species including rice, pulses, millets, vegetables, fruits and other fibre plants[1]. With the Convention on Bio-Diversity, a variety of instruments have been used to protect agro bio-diversity. Intellectual property rights (IPR) is one of them. Though the sui-generis system of Plant varieties Protection and Farmers Rights Act (PPVFRA) is talked about as a tool of protecting agro-biodiversity, this paper focuses on and argues that Geographical Indications (GIs) - one of the IPR tools that is used to protect the collective community rights - is equally important in protecting agro biodiversity.

The Convention on Bio Diversity (CBD) defines agro biodiversity (ABD) to "include all components of biological diversity of relevance to food and agriculture, and all components of biological diversity that constitute the agricultural ecosystems: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, which are necessary to sustain key functions of the agro-ecosystem. Agrobiodiversity is the outcome of the interactions among genetic resources, the environment and the management systems and practices used by farmers and herders. It has developed over millennia, as a result of both natural selection and human interventions."

Thus, the CBD identifies four dimensions of ABD, i.e. (1) genetic resources that support eco system services upon which agriculture is based (pollution, sediment regulation, erosion control to quote a few examples); (2) abiotic factors (such as local climatic and chemical factors, physical structure and functioning of eco systems which affect agricultural biodiversity); (3) socio-economic and (4) cultural dimensions (agro biodiversity is shaped and maintained by human activities and management practices, thereby foster sustainable livelihoods, encompass traditional and local knowledge of agrobiodiversity, cultural factors and participatory processes)[2]. These aspects converge with the purpose of the sui generis system of GI in India.

GIs are collective marks or indications used in the realm of trade which highlight the quality of the product that is unique to the region. A product recognized by the GI registration also recognizes the uniqueness and cultural and traditional knowledge and practices that are

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[1] http://nbaindia.org/uploaded/pdf/Fact%20Sheets.pdf (accessed June 21, 2016).

[2] https://www.cbd.int/agro/whatis.shtml (accessed on December 1, 2016).

involved in producing the product with the uniqueness. Hence protection of the product with GI indicates the superiority of the product in comparison with similar products and hence the proprietors take effort to nurture the product to maintain the uniqueness, which directly helps in on farm conservation of agrobiodiversity. Though agro biodiversity comprises of plants, crops and eco system services such as soil bacteria, pollinators, microbes and antagonists of pests and diseases which are essential for agriculture, in this paper, the focus is only on agricultural plants and crops that are protected under GI system of India and is organized into four sections. Section 2 following this introduction provides the status of agricultural GIs in India and discusses the protected agricultural GIs by the different characteristics. Strategies for the conservation via GI protection are mentioned in Section 3 and Section 4 suggests the way forward. Section 5 provides the conclusion.

2. Agricultural GIs in India

There has been no separate legislation in India until the Geographical Indications of Goods (Registration and Protection Act), 1999 (GI Act) which came in to practice in 2003. Prior to this, GIs were governed by common law principles, which enabled the aggrieved person to file an action of 'passing off' for protection of his right. The sui-generis system of India recognizes the geographical uniqueness in both agricultural and non-agricultural products. In agriculture category a variety of products like food grains, value added products like tea, coffee, jaggery, jasmine have been protected, which is mentioned in Table 1.

Table 1: Registered GI Agricultural Products of India

Sl. No.	State	No. of Agricul-tural Products	Total No. of GI Products	% of Agricul-tural to total	Name of the Products
1	Karnataka	16	35	45.7	Coorg orange, Mysore betel leaf, Nanjanagud banana, Mysore jasmine, Udupi jasmine, Hadagali jasmine, Monsooned Malabar arabica coffee, Monsooned Malabar robusta coffee, Coorg green cardamom, Devenahalli pomello, Appemidi mango, Kamalapur red banana, Byadagi chilli, Udupi Mattu Gulla brinjal, Bangalore blue grapes, Bangalore rose onion
2	Kerala	11	23	47.8	Navara rice, Palakkadan Matta rice, Pokkali rice, Wayanad jeerakasala rice, Wayanad gandhakasala rice, Kaipad rice, Malabar pepper, Alleppey cardamom, Vazhakulam pineapple, Central Travancore jaggery, Chengalikodan nendran banana
3	Maharashtra	19	24	75.0	Mahabaleshwar strawberry, Nashik grapes, Nashik valley wine, Kolhapur jaggery, Nagpur orange, Ajara Ghansal rice, Mangalwedha jowar, Jalna sweet orange, Sindhudurg & Ratnagiri Kokum, Waghya Ghevada, Navapur Tur dal, Vengurla cashew, Lasalgaon onion, Waigaon turmeric, Solapur pomegranate, Sangli raisins, Jalgaon brinjal, Beed custard apple, Purandar fig

Sl. No.	State	No. of Agricul-tural Products	Total No. of GI Products	% of Agricul-tural to total	Name of the Products
4	Tamil Nadu	5	25	20.0	Eathomozhy coconut, Nilgiri tea, Virupakshi Hill Banana, Sirumalai Hill Banana, Madurai malli
5	West Bengal	4	10	40.0	Laxman Bhog mango, Khirsapati (Himsagar) mango, Fazli mango, Darjeeling tea
6	Uttar Pradesh	3	21	14.3	Allahabad surkha, Mango mallihabadi, Kalanamak rice
7	Assam	3	4	75.0	Assam tea, Assam Karbi Anglong ginger, Tezpur litchi
8	Gujarat	2	9	22.2	Bhalia wheat, GirKesar mango
9	Odisha	2	14	14.3	Ganjam kewra rooh & Ganjam kewra flower
10	Nagaland	2	2	100.0	Naga mircha, Naga tree tomato
11	Meghalaya	2	2	100.0	Khasi mandarin, Memong narang
12	Andhra Pradesh	1	12	8.3	Guntur sannam chilli
13	Himachal Pradesh	1	5	20.0	Kangra Tea
14	Arunachal Pradesh	1	1	100.0	Arunachal orange
15	Tripura	1	1	100.0	Tripura queen pineapple
16	Sikkim	1	1	100.0	Sikkim large cardamom
17	Mizoram	1	1	100.0	Mizo chilli
18	Manipur	1	4	25.0	Kachai lemon
19	Punjab, Haryana, Delhi, Himachal Pradesh, Uttarakhand, and parts of western Uttar Pradesh and Jammu & Kashmir	1	1	100.0	Basmati rice
20	Uttarakhand	1	1	100.0	Uttarakhand tejpata
	Total	**78**	**241**	**32.1**	

Source: Compiled from the GI registry; http://ipindia.nic.in/girindia/
Note: The total number of GI products includes products other than agriculture also.

A look at the products filed under GI (Table 1) reveal that it consists of famous basmati rice, Darjeeling tea, alphonso mangoes as well as relatively less known kalanamak and kaipad rice varieties and Memong narang which is known for its medicinal properties. Evidently, though the purpose of GI is to provide protection from infringement in the market place and economic returns to the producer, yet the GI protection for products that are relatively less known and cultivated in small areas, reveal a different purpose. This purpose is to acknowledge the traditional knowledge and farm practices that have gone to conserve the varieties. For instance,

in the case of the monsooned Malabar arabica and robusta coffee registered under GI, the protection has been for the traditional knowledge based practices that uses the conducive weather to process the coffee beans to get the aromatic coffee. With these purposes in mind, GI recognition for agricultural products has been recognized.

2.1 Details of Agricultural GIs in India

There were 241 registered products in India as on June 15, 2016. Of these, agriculture (32%), handicrafts (31.5%) and textiles (29.5%) account for more than 90 per cent of the total registered products in India. Of the 78 agricultural products registered with GI, Maharashtra leads the rest of the states in the total number of registered products (19 out of 78) closely followed by Karnataka (16) and Kerala (11). Thus, these three states account for 58 per cent of total agricultural products registered in the country. Assam and Uttar Pradesh (3.9% each), West Bengal (5.2%) and Tamil Nadu (6.5%) account for additional 20 per cent of total agricultural products registered. Himachal Pradesh, Rajasthan, Arunachal Pradesh, Tripura, Sikkim, Mizoram, Manipur, (Punjab, Haryana, Himachal Pradesh and Jammu and Kashmir together hold the Basmati GI) and Uttarakhand have only one GI in the agricultural section.

30 fruits (39%), 12 spices (15%), 11 food grains (14%), 6 each beverages and vegetables (8%), 5 flowers (6.5%), 4 others (5.2%), 2 dry fruits, and 1 pulse variety constitute the agricultural GIs. Fruit GIs consist of different varieties of oranges (6), banana (5), mango (6), pineapple (2), grapes (2), lemon (2) and 1 each of coconut, strawberry, litchi, custard apple, pomegranate, fig and guava. The different constituents of spices are: chilly (4), cardamom (3), ginger (1), pepper (1) kokum (1), Tejpata (1), and turmeric (1).There are 9 rice varieties and 1 variety of wheat under the good grains. Of the 5 varieties of flowers, 4 are varieties of jasmine. Four tea varieties and two coffee varieties (GI for processing) constitute the beverages segment. Of the six vegetables that have got GI, two each are onion and eggplant varieties, and one each for tomato and beans.

Table 2: Status of Agro Biodiversity

Number of Species known in total (approx.)	Number of Species cultivated (approx.)	Most important to global-level food supply	Number of Domestic breeds and varieties	Number of Domestic breeds and varieties at risk	Number of Domestic breeds and varieties extinct
Plants 17,000 >900 species of wild relatives of crop plants	811	Rice and kodo millet, black gram, green gram and spices such as black pepper, turmeric, cardamom and ginger and fruits such as jack fruit and mango	Many thousands Rice: 50,000 Sorghum: 5,000 Mango: 1,000 Pepper: 500	1000's	Not known

Source: Compiled from Kumar (2016).

Compared to the agricultural diversity mentioned in Table 2, the number of products protected in each of the category is very small as detailed above and Table 1. However, filing GI requires tremendous human resources to document the historical evidence of association of a crop/plant/product with the region. Moreover, it requires financial resources to form a producer group, register the same with the legal entity, establish market, and so on. Unlike the European countries, in India, the expenses for the filing of the GI application are borne by the producer associations (Lalitha and Vinayan, forthcoming). Though the government and its various arms like horticulture department, agro corporations and commodity boards have taken the initiative to register the products (Table 3), the economic returns on such investment are not known. Different associations account for about a third of the proprietors of the registered products.

Table 3: Proprietors of Agricultural GIs in India

Type of Proprietor	No. of Agricultural Products	% Share
Commodity Board	12	15
Central Government	12	15
FPO & University	2	3
State Government	13	17
Trust	2	3
University	8	10
Associations (Farmer/Producer/ Trader/ Manufacturer)	24	31
Cooperative	5	6
Total	78	100

Source: Compiled from the GI registry http://ipindia.nic.in/girindia/

2.2 GIs and Agro Biodiversity

The discussion on product profiles of agricultural GIs registered so far indicates the rich biodiversity of products across the country. These GI products can be categorized into three: 1. GIs that have strong association with the region through the land, soil, water and other climatic factors, a criterion which most agricultural GI products satisfy. Notable among these are the varieties of tea grown at Darjeeling, Nilgiri, Assam and Himachal Pradesh, cardamom from Sikkim, Appemidi mangoes from Karnataka, the Monsooned Malabar arabica and robusta coffee that derive their uniqueness from the climatic factor that plays a crucial factor in the processing of coffee and the list goes on; 2. GIs that have been protected based on natural factors and also based on the idea of protecting different varieties and those that are becoming extinct (even within the state). Implicitly, while the generic varieties of pineapple, oranges and bananas are grown in different parts of the country, yet a few varieties have been nurtured in specific areas. For instance, the Coorg and Nagpur oranges are distinct in their taste, color and appearance. Naga chilli is distinctly different from the byadagi chilli. Naga chilly has the Guinness book of records for its high capsaicin content, byadagi chilli has the least capsaicin content and sought for its high color quotient; (3) A few agricultural GIs have strong medicinal

values associated with them and is specifically mentioned in their statement of case like the Memong orange. Memong narang is grown only in Meghalaya. These oranges are not edible but are used as medicine and in medicinal preparation for small pox, jaundice, stomach and kidney diseases in human and livestock. Similarly the navara rice of Kerala is known for its medicinal values.

2.3 GIs that strengthen the plant genetic resources

Mizoram is considered to be the germplasm bank for Mizo Chilli[3]. When the ICAR Research Complex for NEH Region, Umiam conducted vegetable improvement program in North East, around 80 genotypes of chilli were collected from Mizoram. Similarly the rice varieties of Kerala are the potential source for germplasm bank.

Generally in the NE states, the availability of chemical fertilizers and pesticides is limited. As the products are organic by default, it further adds value to the GI tag. Sikkim is already known for its organic farming where legislation prevails to support organic farming as the only form of farming. There are several high value products like cardamom and chilies and other perishables from North Eastern states which can effectively be targeted towards the organic markets. Naturally organic products from specific geographical regions become farmers' own brands and can attract a premium price compared to their inorganic counterparts. However, for authentication, organic products need to be certified by a standard organization for barcoding and traceability.

India is rich with many scented varieties of rice but due to the importance given to basmati, the existence of more than 300 non-basmati scented rice varieties in India has been overshadowed.[4] The registered varieties include Wayanad jeerakasala and gandhakasala aromatic rice varieties which are like basmati but small in size and golden in colour. The Wayanad jeerakasala rice is cultivated during winter and gandhakasala is a long duration crop. Kalanamak rice is a variety from Uttar Pradesh which has husks that are black in color and is scented rice. In local markets, the price of kalanamak rice is higher than that of the basmati rice. Ajara Ghansal rice from Kolhapur, Maharashtra is also aromatic rice and is creamy white in color. The specialty is that this rice is polished manually. Nearly lives of 2200 farmers are dependent on this rice. It is estimated that this variety cultivated in about 513 hectares provides a total of 17955 quintals or around 35 quintals per hectare spending around Rs.20000 per acre. The areas of aromatic rice cultivation are based at the foothills and are characterized by relatively low temperature, fertile lateritic soil and favorable cool and dry climate at the stage of maturity for development and retention of high aroma[5].

The relatively more number of varieties registered by Kerala appears to have stemmed out of the realization for the need for protection, given the reducing diversity in the rice varieties. For instance, during an evaluation study of the People's Biodiversity Registry (PBR) of 20

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3 *GI Journal,* 61, November, 2014, p.56.

4 http://www.downtoearth.org.in/coverage/kalanamak-10106 (accessed on June 21, 2016).

5 *GI Journal,* 76, November 2015, p.8.

panchayats of the Wayanad district by the Kerala State Biodiversity Board (KSBB), it came to light that 168 rice varieties, including 78 traditional ones, were originally cultivated in the district. However, 55 traditional rice varieties including Achatti, Chenachundan, Chena Puncha, Chara, Cheera Nellu, and Channa have vanished from the farming calendar of Wayanad. Alarmed by the threat, the KSBB is planning to approach the cultivators to farm them for conservation. KSSB is also exploring the possibility of setting up a paddy seed bank of traditional varieties in Kerala.[6]

2.4 GIs that recognize the abiotic factors

It is, however, interesting to note that the geo factor of many of the agricultural products do not allow the crop/tree to grow in any other place, resulting in the strong geo appeal to the product. For instance, the attempts to cultivate the Dusseheri variety of mango do not succeed often "as an experiment to cultivate in south India failed to develop the rich orange yellow color that it acquires in Northern India when fully ripe"[7]. Experiments done with Naga chilly in Gwalior, Imphal and Uttarakhand did not yield the same level of pungency (cited in Meghvansi et al., 2010). These qualities provide more authenticity to the product. Hence, the small holding nature of the Indian agriculture and the diverse cropping should be taken advantage of.

GI recognized pokkali and kaipad rice varieties are known for their taste which has been acquired as the cultivation takes place in saline areas. Pokkali system depends on traditional cultivars like *Chootu Pokkali*, *Chettivirippu*, *Cheruvirippu*, *Kuruva*, *Anakodan*, *Eravapandy*, *Bali*, *Orkayama*, *Orpandy* and *Pokkali*. These varieties are valuable as gene donors in international rice improvement programs for salinity tolerance. This variety also won the central government's Plant Genome Saviour Community award 2011.[8]

Pokkali rice is grown in the saline water submerged fields. Interestingly, the salinity which increases during the summer months gets washed away during monsoon and the soil is regenerated and becomes suitable for cultivation of pokkali rice. Rice cultivation is done during the low saline phase of May-June to September-October. After rice cultivation is over, the fields are used for prawn cultivation. The daily tidal inflow and outflow of backwaters, the leftover biomass of the rice plant and the prawn cultivation in pokkali field add to the nutritional value of rice. While 90 per cent of the land is only single cropped, in a few stray patches second crop of paddy is also cultivated. Further, the value added products of this rice variety like the rice flour, rice flakes and rice bran oil are also much sought after.

Similar to pokkali rice, kaipad rice tract is spread in the north Malabar districts, Kozhikode, Kannur, and Kasargod. These tracts are coastal wetlands at the bank of rivers flowing through these districts and joining the Arabian Sea. The cultivation practices are similar except for the fact that the kaipad rice tract is on the banks of rivers which are susceptible to salinity due to

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6 http://www.thehindubusinessline.com/economy/agri-business/traditional-rice-varieties-vanishing-in-kerala-study/article3699742.ece

7 *GI Journal*, 28, November 2008, p.93.

8 http://www.downtoearth.org.in/coverage/back-from-the-brink-42846 (accessed on June 21, 2016).

tidal movements. The average yield of pokkali and kaipad rice ranges 1-3 tonnes per ha. This variety has almost become extinct as large tidal marshes of land has been left fallow but is getting revived due to the efforts of the rice-cum-shrimp scheme of the Agency for Aquaculture Development, Kerala (ADAK).[9] Scientists have developed a kaipad variety of rice that is also suited for non-kaipad regions also (Vanaja et al., 2015). Though such varieties if successfully cultivated elsewhere may potentially compete with the registered GIs as these are not associated with the names of the places, but rather associated with the system of cultivation.

2.5 GIs that foster social and cultural dimensions

Agro biodiversity as mentioned earlier is the result of human involvement and activities evolved over thousands of years. The genetic resources and their nurturing cannot be separated from human skills involved in cultivation. For example, one of the reasons for the high cost of the aromatic Ajara Ghansal rice is the fact that this rice is polished manually by traditional means (Bholake, undated). Though Ajara Ghansal rice is relatively more cost intensive and yields less than other rice varieties in the region like Ratnagiri, Sonam and Komal, yet the price advantage of Ghansal rice at Rs. 3500-4000 per quintal compared to Rs.1200-1500 per quintal of other varieties, make it attractive for farmers to cultivate this variety (Bholake, undated).

GI has been instrumental in promoting agro-tourism in several states. Some of the tea estates in Nilgiri and Darjeeling, offer home stay for tourists, which provide them the unique experience of staying and participating in tea plucking and tea tasting operations. Orange festival in Meghalaya around the orange harvesting season is another example. Similarly, agrobiodiversity rich areas like Kerala and North Eastern states of India have become a natural choice as tourist destinations both for domestic as well as international travelers.

2.6 Threats to GI being a agro biodiversity promoter

Pests, diseases and reducing area under cultivation are the major issues generally for agricultural products and GI protected agro products are not an exception. For instance, orange growing areas of Lohit and Lower Dibeng Valley were severely affected by the citrus greening and viral infections in 2014.[10] Similarly, between 1995 and 2004, less rainfall, prolonged hot season, repeated white fly attack and reducing water tables resulted in reducing the area under orange in Nagpur division from 60000 ha to 30000 ha. The intense heat in 2010, where the temperature hovered around 48 degrees for a week, resulted in 1.76 and 2.9 million trees dying in Nagpur and Wardha districts of Maharashtra. This led to an all-time low yield of the orchards of the region yielding only 20 per cent fruits.[11]

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[9] http://www.thehindu.com/news/national/kerala/kuttoosan-rice-to-be marketed/article7804755.ece (accessed on June 21, 2016).

[10] http://timesofindia.indiatimes.com/city/guwahati/Citrus-fruit-gardens-under-threat-in-Arunachals-orange-bowl/articleshow/45845443.cms; http://www.business-standard.com/article/pti-stories/decline-in-citus-fruit-production-causes-concern-114111700313_1.html (accessed on June 23, 2016).

[11] http://www.downtoearth.org.in/coverage/orange-tumbles-37976 (accessed on June 23, 2016).

Repeated prawn cultivation alone in the areas where Pokkali rice was being cultivated has resulted in increasing the salinity ingress of the region.[12] The area under Pokkali rice has significantly declined from 24000 to 5000 ha over the two decades and now only 1000 ha land is actively being cultivated with this variety. There are fears of this variety facing extinction due to rising cost of cultivation, environmental pollution, and lack of availability of labour, low productivity and plant diseases.[13]

Appemidi mango trees, which naturally grow in the riverbanks of Aghanashini, Betdi and Sharavati, are going scarce due to their illegal felling in their natural habitat. The juicy Coorg orange is another example. Grown mostly among the rich coffee plantations and used to be in abundance before the 1970s, this is now becoming extinct. Many coffee estates have removed the orange trees following a rise in the price of coffee. Virus attack on the orange trees and the use of chemical plant protection methods are other reasons for their reducing number. Three GI products, namely, the Nanjanagud banana, Mysore malligae and Mysore betel leaves have almost become extinct in Karnataka. The area under Nanjanagud banana was reported to be only 30 acres due to widespread panama wilt disease. In order to promote the area under cultivation, the University of Agricultural Sciences, Bangalore distributed about 12000 banana saplings to 30 enterprising farmers. The high labour cost involved in Mysore malligae and Mysore betel leaves have also made farmers shy away from these products. Malda mangoes of West Bengal that are much sought after in the export markets of Europe and United Arad Emirates (UAE) face a threat due to the relatively high pesticide residue content in them. Expressing its concern the Ministry of Climate Change and Environment, UAE has mandated that every consignment should be accompanied by the phyto sanitary certificate regarding the levels of pesticide residue. These tests need to be carried out by any APEDA certified laboratory.

2.7 Potential GI products

Given the rich agro-biodiversity of India, the number of agricultural products registered so far is very less. A few potential products are mentioned here.[14] The rice-fish culture practiced by the Apatani tribe of Arunachal Pradesh, who cultivate Mipya and Emu wet varieties of rice along with fish is a potential candidate for GI.

Kagga rice was earlier cultivated in around 2000 ha in the bed of Aghanashini creek of Uttarakannada, which has now reduced to 1200 ha. This is a salt water tolerant variety similar to the Pokkali and Kaipad rice varieties of Kerala. The thick coating of red bran helps in slow digestion and gives more energy. The soup made of this rice acts as a coolant for the body. There is an assured yield of 1000 to 1200 Kg per acre. Similar to the Pokkali rice cultivation, the Kagga rice field is also used for prawn cultivation from the month of September.

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12 Fn.3

13 http://www.thehindu.com/news/cities/Kochi/sreenivasan-all-praise-for-pokkali-farming/article5890418.ece (accessed on June 21, 2016).

14 These various cases have been taken from Government of India (2015).

The Sundarban lands in West Bengal are mangrove lands known for cultivating salt tolerant rice. Three main farmers' varieties grown in the tidal waters are Matla, Getu and Hamilton, which can tolerate up to 14 per cent salinity. These varieties need no attention from the farmer, who after transplanting the crop leaves for his home abandoning the crop till harvest time.

Similarly in Assam, there are scented varieties of rice like Tulsijoha, Kunkunijoha, Bogajoha, Kharikajoha, along with other varieties like Noibhunni, Parasakabhunni and Boka. Out of this Boka is a soft rice variety, which need not be cooked and can be eaten with milk, banana, sugar or jaggery and is a good food material to be given to the victims during flood or other disasters. Boka is also valued for its flakes and for its pop-corn (GOI 2015:18).

Kuttanad in Central Kerala is one of the few places in the world where traditional farming is carried out below sea level due to the peculiarities of its landscape and said to be more than 150 years old. Farmers here practice rice and aqua culture by alternating flooding and draining using the bunds according to the farming calendar. The biodiversity in this region includes 65 fin fish and 14 shell fish, mangrove forests that protects against sea level rise and three varieties of salt tolerant rice and ducks. Importantly, this farming system has been recognized as Globally Important Agricultural Heritage Systems (GIAHS) at the International Forum on GIAHS held in Japan in 2013 by the United Nations Food and Agriculture Organization (GOI 2015:14). However, among the salinity resistant varieties of rice from different parts of India only Pokkali and Kaipad rice varieties from Kerala and Kalanamak rice from Uttar Pradesh been registered with GI so far.

3. Strategies

As mentioned elsewhere in the paper, except for the plantation crops, spices and Basmati rice, the area under the GI protected crops is relatively small compared to the commercial crops. This is the natural outcome of the approach of the government where the focus has been to make an 'inventory of GI products' so far. Post GI registration activities have not been initiated to realize the market potential of such products. Often the knowledge regarding the geo- specific qualities of such products is limited to the region and thus, the market is not remunerative. Hence, it is natural for the farmers to trade the land of the crop with limited market to another crop where the economic returns could be higher or leave agriculture totally. Already the Census of India (2011) has noted the declining number of farmers. Such a trend has direct implication for the livelihood of farmers in particular and nutritional security in general. For instance, the Navara rice of Kerala that is used in the Ayurvedic system of treatment is sold between Rs.600-800 per kilo gram. But it should be noted that in order to realize such economic returns, investments should also be made in maintaining code of practices so (CoP) that every farmer producing the GI product adheres to the prescribed standards and produce the same quality product. The different components of CoP in GI are: specific definition of the product, delimitation of the area and the guarantee system for the traceability and quality. Such CoPs are widely prevalent, for instance, in the production of Champagne in France and saffron in Spain. In Thailand, the Department of Intellectual Property has a memorandum of understanding with the Department of Thai Industrial Standard Institute (TISI) and National Bureau of Agriculture Commodity and Food Standard (ACFS). The MOU means that these agencies work for the development of control systems in Thailand. Once the systems are developed, DIP validates the specifications and inspection methods (Lalitha, 2016). Studies have

also shown that consumers are willing to pay a higher price for such quality ensured GI products. Consumers would be attracted to GI products and would be willing to pay more, if farmers are able to demonstrate the distinctness of the product by its visual features or by its taste or by advertisement. When the consumers verify and are satisfied with the differentiation, the value of the GI product increases as the consumers are willing to pay a higher price for the differentiation, (Reviron, 2009). Willingness to pay for GI protected agricultural products carried out in the context of India (Soam and Sastry, 2008; Vinayan, 2015) reveal that consumers were willing to pay 10-15 per cent more and in certain products double the price because they are of distinct and of good quality. Similar results were also found by studies conducted by Rose and Umesh (2012) and Datta (2010) on Indian agricultural GIs. In the case of India, though there are internet based residual traceability systems in place like Hortinet, GrapeNet, MangoNet, Tracenet and Peanutnet, yet it is evident that there are still issues with adherences to such practices. Instances like ban by a major importing country would adversely affect the brand image and export of such products from the country. Nevertheless, CoP should not gravitate towards "excessive homogeneity and/or industrialization, which destroys local identity and typicality" (Santhili, 2012). The core of COP should be aimed at promoting diversity and even the phytosanitary regulations should "seek a balance between human health and food security standards and the recognition of the value of local and traditional practices which are relevant for agricultural diversity"(*Ibid*).

A product qualification like GI can boost the livelihoods of people associated with its entire value chain, if the different stakeholders of the entire value chain are appropriately identified, sensitized and are subjected to rules laid out by producer associations to realize the economic benefits out of the certification mark. Thus, "the legal recognition of geographical indications provides an institutional tool through which to address these problems and consequently provide rural communities with the opportunity to valorize their local production and extract rents based on local savoir faire" (Bramley et al., 2009: 110). Here where the challenges occur for the producer organizations as the farmers will have to be organized and brought under one umbrella. In India 30 per cent of the total agricultural GIs have been registered by the associations of farmers, traders or manufacturers and thus a beginning has been made. However, mere formation of associations and FPOs do not serve the purpose as is evident from many defunct FPOs in the country for a variety of reasons ranging from lack of training to clear strategies (Singh & Singh, 2013). Handholding of FPOs for a specific period of time by experienced individuals or organizations is often required to strengthen capacities and to build and maintain the brand image of the product.

4. Strategies to converge agro biodiversity with GI

As mentioned elsewhere in this paper, there are some regions rich with agrobiodiversity. However, not all the GI potential products from such areas have been registered with the GI. Then the moot question is how we recognize the GI potential products in agro diversity rich areas.

Table 2 indicates the rich agrobiodiversity in India and the task at hand for GI registration. Out of 17000 plant species, only about 811 are cultivated. Out of 50000 varieties of rice, it is not clear how many still cultivated and how many may have become extinct. The registered GIs mentioned here hardly form a miniscule segment of the plant varieties known. In this context, it

is recommended that the different states gear up their administration to speed up the work on forming the biosafety committees and the people's biodiversity register (PBR) which is discussed below.

In order to effectively implement the BDA 2002, three layers of institutions have been set up in India. These are the National Biodiversity Authority (NBA) at the central level, State Biodiversity Boards (SBB) at the state level and the Biodiversity Management Committees (BMC) at the level of local state governments.

NBA was set up in 2003 and is located in Chennai. NBA deals with matters relating to requests for access to biological resources by foreign individuals, institutions or companies and all matters relating to transfer of results of research to any foreigner. SBBs look after the applications for the access to the bio-resources by Indians, Indian companies and institutions. SBBs also have the power to restrain any activity that violates the objectives of conservation.

At the next level, state governments with the help of local government bodies will have to set up the BMCs in their jurisdiction for the conservation, sustainable use and "documenting the biological diversity including preservation of habitats, conservation of landraces, folk varieties and cultivars, domesticated stocks and breeds of animals and microorganisms and chronicling of knowledge relating to biodiversity"[15]. The crucial function of the BMCs is to prepare the peoples' biodiversity register (PBR). PBRs are comprehensive documentation on availability and knowledge of local biological resources, their medicinal or any other use or any other traditional knowledge associated with them. The PBRs focus on participatory documentation of local biodiversity, traditional knowledge and practices. They are seen as key legal documents in ascertaining the rights of local people over the biological resources and associated traditional knowledge. For the PBR, the required information is collected through the information available in the public domain, and use of primary research tools like participatory rural appraisal at village level, household interviews, individual interviews with village leaders and knowledgeable individuals, household heads, key actors of the panchayats, NGOs and direct field observations.

According to the information available on the website of National Biodiversity Board, in total2485 PBRs have been prepared with Kerala on the top with 758 PBRs, followed by Madhya Pradesh (Table 4). However, in terms of registering the products with GI, Kerala has 11 agricultural products, while Madhya Pradesh is yet to register an agricultural product[16].

[15] http://nbaindia.org/uploaded/pdf/Fact%20Sheets.pdf

[16] The decision to register Madhya Pradesh's Basmati rice with GI Registry is pending before the legal courts.

Table 4: Number of People's Biodiversity Registers

S. No	Name of the State	No. of PBRs
1	Andhra Pradesh	28
2	Assam	6
3	Chhattisgarh	7
4	Gujarat	133
5	Haryana	--
6	Jharkhand	11
7	Karnataka	468
8	Kerala	758
9	Madhya Pradesh	704
10	Maharashtra	37
11	Manipur	10
12	Mizoram	3
13	Odisha	76
14	Telangana	9
15	Tripura	126
16	Uttar Pradesh	11
17	Uttarakhand	22
18	West Bengal	76
	Total	2485

Source: http://nbaindia.org/content/105/30/1/pbr.html (accessed on December 2, 2016).

The NBA provides a detailed template for collecting information through PBRs, which is available on their website. For instance, the format for crop plants provides important information on the plant variety, local name, scientific name, variety, habitat/landscape, source of seeds/plant, local availability status of the plant in the past and present, uses, plant part used, associated TK, other details such used for market or own use, community/knowledge holders etc.. The document should be endorsed by the BMC and later publicized in the Gram Sabha / Gram Panchayat / Panchayat Samiti. The document can be a very useful tool in the management and sustainable use of bio resources and for identifying the potential GI products.

The format provided in Table 5 would be very useful in documenting information about the various food crops, medicinal plants and vegetables cultivated by different communities (Lalitha, 2013) and are also useful for filing GI application. Comparison of the different PBRs would point to the potential crops/plants that need to be registered with GI as indicated by the 'local status' mentioned in the above format. Once such information is available with the local communities, then the efforts to form a producer association and documentation to prove the regional links can be made to file the GI.

This will also prove to be an important document which will show the 'bargaining power of the communities' in terms of the resources that are under their control and in deciding the benefit sharing strategy. "If we vest the communities who possess the categories of traditional

knowledge in the sense of ethno botanical knowledge with the right to control physically their territories, then it would help them to impose limitations on users for the usage of biological resources within their territories which is the crux of achieving such community based conservation" (Gehl Sampath, 2003: 36).

Box 1: Convergence of biodiversity and GI at the field level[17]

Cheruvayal Raman is a celebrated farmer from Wayanad, belonging to Kuruchiya tribe who has been conserving more than 40 varieties of rice. This farmer has a total of 6 acres of farm land. In that 1 acre he keeps to grow the rice and other products like sesame to produce enough for his family. In the rest of the land he grows 45 to 50 varieties each in 5 cents of land. The yield from this is basically for the seed varieties. The seeds so conserved by them, he shares with researchers and others on the condition that they return to him the same quantity of seeds in the next season. Interestingly, the researcher concerned has to personally visit and take the seeds from him. After the harvest, the dried stems of paddy are just immersed in water in the field so that the plant residues become a good source of manure and soil nutrient. The government of India has recognized him with the Plant Genome Saviour award. As mentioned earlier, two of the aromatic rice varieties cultivated by his community in the area known as Wayanad gandhakasala and Wayanad jeerakasala have also been registered with GI. Twenty rice varieties have also been registered with the PPVFRA.

5. Concluding Remarks

Agricultural GIs and agro biodiversity are two sides of the same coin as both converge on the points of conservation and GI goes further with market returns. Therefore, ensuring conservation of agro biodiversity and protecting them with GI would help the farmers with multiple benefits. GI should not be viewed as a standalone factor, but should be viewed as a developmental tool intertwined with other programs like rural development, environment protection and agro biodiversity conservation. However, efforts should not stop with identification of GIs alone, but should have market strategies and also focus on value addition. Agro biodiversity conservation efforts of farmers should be recognised with incentives.

[17] Sincere thanks are due to the scientists from MS Swaminathan Research Foundation, Wayanad for providing an opportunity to the first author to meet this farmer.

Table 5: Format for Crop Plants

1	2	3	4	5	6	7		8	9	10	11	12	13	14
Crop	Scien-tific Name	Local Name	Variety	Land-scape/ habitat	Approx. area shown	Local status		Special features	Cropp-ing season	Uses	Asso-ciated TK	Other details	Source of Seeds/ plants	Commu-nity/ Know-ledge Holder
						Past	Present							
Rice	Oryza Sativa		Veliyan	Low-land valleys		Plenty	Rare	Tall variety, high yield resistant to drought, flood, pest and diseases		Food, fodder, roofing Fuel	Pro-vides more energy	Suitable for 'Valicha' culti-vation		Kurichiya Kuruma W. Chetty

Source: http://nbaindia.org/uploaded/pdf/PBR%20Format%202013.pdf, accessed, December 2, 2016.

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