CHAPTER 4
AGRO BIODIVERSITY OF DOMESTICATED CROPS IN THE STUDY AREA

Paddy, legumes, mango, banana, jackfruit, sugarcane and vegetables are the important agricultural crops of the district of coastal Karnataka. There are traditional varieties and modern HYV (High Yielding Varieties) in each of these crops adopted by the farmers. The diversity among each of these crops and several others is quite high requiring systematic survey and documentation.

4.1 PADDY

Paddy is the main cereal crop grown in the wetlands of coastal Karnataka. Large varieties of paddy crops are grown abundantly in the coastal region as compared to other ecological regions as shown in table 4. Traditional varieties are grown only for household consumption. These traditional varieties are distinct in morphology, taste, aroma, quality and other special features. Despite the small area under rice, the local varieties grown are many as shown in table 4.

Table 4: Traditional and hybrid paddy crops cultivated in Coastal Karnataka

Taluks	Coast		Inland		Foot hills	
	Traditional	**Hybrids**	**Traditional**	**Hybrids**	**Traditional**	**Hybrids**
Mangalore	19	11	22	7	15	8
Bantwala	21	12	22	11	21	7
Belthangadi	16	11	12	9	47	9
Udupi	16	8	15	6	13	6
Karkala	21	14	9	13	13	8
Kundapur	18	10	16	8	15	5
Bhatkal	18	12	16	12	11	8
Honnavar	23	15	14	10	17	12
Ankola	19	12	19	11	16	9
Kumta	21	13	18	11	16	9
Karwar	12	7	13	8	11	6
TOTAL	***84***	***28***	***73***	***19***	***76***	***15***

Note: Traditional varieties of paddy cultivated in coastal, inland and foothill regions are 84, 73 and 76 respectively. Hybrid varieties of paddy cultivated in coastal, inland and foothill regions are 28, 19 and 15 respectively. Cultivation of traditional and hybrid varieties in each coastal taluk varies depending on the climatic and edaphic factors besides the choice of crop varieties available to farmer.

Kanwa is a nutrient rich rice and Parimala sannakki, Gulwadi sannakki, Gandsale, Girsale are scented varieties of rice. Kagga variety of rice is cultivated in salt water and few traditional varieties are shown in the photographs.Mr. Deva Rao of mittabagilu village in Belthangadi taluk of Dakshina Kannada district has maintained 47 local varieties of paddy with a small seed bank. These local paddy varieties are associated with the culture and tradition of local areas and they are used on different occasions based on their special characters. As some paddy varieties are best suited for Avalakki, Parimala sannakki rice is good for preparing eatables and sweets. Some paddy varieties are grown only for the preparation of dosa/idly. These varieties are easily mashable with little boiling. Chintamani

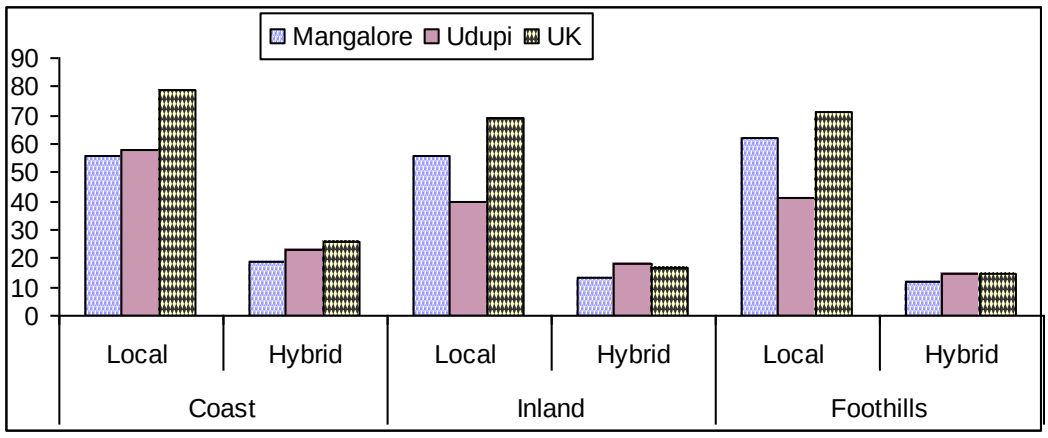
variety of rice is hard even after boiling for a long period. Diversity of traditional varieties and hybrids was found to be higher (84 traditional varieties and 28 hybrid varieties) in coastal region than other ecological regions as shown in table 4.

Table 5: Local and hybrid paddy crops cultivated in Coastal Karnataka

Districts	**Coast**		**Inland**		**Foothills**		***TOTAL***	
	Local	**Hybrid**	**Local**	**Hybrid**	**Local**	**Hybrid**	***Local***	***Hybrid***
DK	56	19	56	13	62	12	***63***	***19***
Udupi	58	23	40	18	41	15	***60***	***24***
UK	79	26	69	17	71	15	***84***	***28***

Uttara Kannada is having higher diversity of paddy (84 traditional and 28 hybrid paddy varieties) as compared to Dakshina Kannada (63 & 19) and Udupi (60 & 24) districts as given in table 5. Introduction of commercial cultivation of prawn in wetlands has affected the cultivation of paddy in the region. Incidence and spread of disease in the cultivation of prawns has distracted the farmers. The farmers started thinking about alternatives when the cultivation of prawn was affected. Ultimately they resorted to use of pesticides and inorganic fertilizers in heavy dose for cultivation of newly introduced exotic High Yielding Varieties of crops for boasting the yield.

Figure 1: Graphical representation of paddy crops cultivated in Coastal Karnataka



There are 84 traditional varieties of paddy and 24 HYV documented after sample survey as described in 4.1.1 and 4.1.2. The trend of diversity in Coastal ecological region of Uttara Kannada and Udupi district is higher compared to other two ecological regions. The trend is almost similar between the ecological regions in Dakshina Kannada as shown in fig.1. Diversity of traditional varieties of paddy is highest in Uttara Kannada district followed by Dakshina Kannada district and Udupi district as shown in table 5. High Yielding Varieties of paddy occupy the majority of paddy growing areas. Diversity of high yielding and traditional varieties of paddy is very high along the coastal ecological region as compared to other regions as shown in fig. 1. The 1001 and Jaya varieties of paddy are dominant in Uttara Kannada, while MO4 and Jaya paddy varieties are common in Udupi and Mangalore districts. Mr. Devarao of Mittabagilu village, Belthangadi taluk has maintained a seed bank

and 47 traditional paddy varieties. Mr. S. V. Hegde, Agricultural officer from Honnavar has maintained good number of paddy varieties.

4.1.1 Description of fragrant paddy (*Oryza sativa*) crops cultivated in Coastal Karnataka:

Sl. No.	Local name	Description
1	Gandsale	Scented, small grains, tall crop with low yield. Long duration (185 days) crop with low yield, used as raw (Belthakki) rice and best suited for Pulav, Payasam. The crop is harvested 20 days from Panical blooming.
2	Parimalasanna bhatta	Small rice, very aromatic and good quality for benathakki, which is used for preparation of sweets.
3	Gulwadi sannakki (photo sheet 4.1.3 plate 10)	Small, short, scented grains, tall crop; medium duration crop of 115 days is used as raw (Benthakki) rice. It is native to Kundapur taluk of Udupi.
4	Pitsale	Red, medium sized scented grains used as boiled (Kucchulelakki) rice. Old variety, medium duration crop of 135 days. Characters resemble Kaime variety.
5	Basmathi gidda	Small, long, scented grains, Short, improved variety, Medium duration crop of 120 days best suited for transplanting used as raw (Belthakki) rice
6	Basmathi udda	Small, long, scented grains, having hairy tip, short, improved variety, Medium duration crop of 120 days, best suited for transplanting. Used as raw (Belthakki) rice.

4.1.2 Description of traditional paddy (Oryza sativa) crops cultivated in Coastal Karnataka:

Sl. No.	Local name	Description
1	Rajkaime (photo sheet 4.1.3 plate 11)	Round grains, tall crop with low yield. Long duration crop (180 days) used as raw rice (Belthakki) and best suited for eatables fried in oil. Paddy is heavy in weight and pest resistant. Rice tastes better when we keep it for a year.
2	Rathnachuda (photo sheet 4.1.3 plate 4)	Small, Red grains with moderate taste, Medium duration tall crop (120 days), used as raw rice (Belthakki).
3	Nagabhatha	Big grains with good taste, Long duration crop (150 days). Tall variety used as boiled rice (Kuchalakki).
4	Kanwa	Big, red grains with good taste, Medium duration crop (120 days). Character resembles Kaime variety. Used as boiled rice (Kuchalakki). Native of Kundapur taluk of Udupi District.
5	Masuri	Small grains, tall crop with good yield. Long duration crop (175 days) used as raw rice (Belthakki) and best suited for dosa preparation. Sensitive to stem borer.
6	Kaime	Red grains used as boiled rice (Kucchulelakki). Old variety, medium duration crop (145 days). Needs marginal fertility and yields according to rainfall (more rain more yield).
7	Alyande	Round, red grains used as boiled rice (Kucchulelakki). Characters resemble Kaime variety, Medium duration crop (150 days) and easy to remove debris.
8	Kavalakannu	Red grains, tall crop, Medium duration crop (115 days) used as boiled rice (Kuchalakki). Small mark on the edge of the grains, whole plant becomes red during panicle initiation.
9	Jirige sanna	Small grains, tall crop with low yield. Long duration crop (160 days) used as raw rice (Belthakki). Character resembles to Gandsale.

10	Hallangi	Red grains used as boiled rice (Kucchulelakki). Old variety, medium duration crop (140 days). Characters resembling to Kaime variety.
11	Kolakedodra	Red grains, tall crop, Medium duration crop (125 days) used as boiled rice (Kuchalakki). Size of rice is bigger when boiled.
12	Moradda	Big, Red grains, tall, local variety, Short duration crop (90 days) used as raw rice (Belthakki).
13	Misebhatha	Red, big grains, grains have hairy tip, short, improved variety, medium duration crop (120 days), best suited for boiled rice Ganji (Kuchalkki ganji).
14	Ajipasale	Big grains, tall, local variety, Short duration crop, (100 days) panicle initiation after 60 days after transplanting. Old variety performs better for transplanting, used as boiled rice (Kuchalakki).
15	Kundapollen	Big, round, scented rice, grains resembling coriander seeds. Medium duration crop (120 days) and rice suitable for raw rice (Belthakki).
16	Kuttikaime	Big, red grains with good taste, Long duration (140 days), tall crop, used as boiled rice (Kuchulakki Ganji), Thick husk resist Bambuchi panical mites. Disease resistant variety needs less fertilizer. Straw is soft and palatable.
17	Suggi kaime	Big, red grains with good taste, Long duration (130 days), tall crop, used as boiled rice (Kuchulakki Ganji). Disease resistant variety needs less fertilizers, thick husk resist Bambuchi panical mites. Straw is soft and palatable.
18	Kalme (photo sheet 4.1.3 plate 12)	Tall variety with small ressish grains, used as raw rice. Variety is resistant to diseases and needs more water.
19	Adenukelte (photo sheet 4.1.3 plate 2)	Small, white, short crop with small grains, with low yield. Long duration (150 days) crop, used as raw (Belthakki) rice.
20	Kamadhari (photo sheet 4.1.3 plate 9)	Big, red grains with good taste, Long duration (150 days). Tall variety used as boiled (Kuchalakki) rice. Native of Thirthahalli taluk of Shimoga district
21	Kari kagga (photo sheet 4.1.3 plate 3)	Kagga – Grown only in severe salt water with long pointed tip in each grain. Grains are black, good in taste, believed to contain high protein and nutrient rich and used only as boiled rice. No input and care is required. Since grown in submerged condition, follow once ploughing. Harvest only top panicles.
22	Chintamani (photo sheet 4.1.3 plate 1)	Grains are round, oval almost looking like Coriandar seeds with long pointed tip in each grain. This grows in submerged condition. This is best for sweet preparation and boiled rice.
23	Jaddu bhatta (photo sheet 4.1.3 plate 6)	Short varity grwon in low laying areas. Small- long grains, good quality rice.
24	Bili pandya (photo sheet 4.1.3 plate 5)	Grown during Khariff season in fresh water, grains are white, round, very good for boiled rice, nutritious and good for body cooling
25	Zigoratogya (photo sheet 4.1.3 plate 7)	Big, reddish grains with good taste, Long duration. Tall variety used as boiled (Kuchalakki) rice.
26	75 days (photo sheet 4.1.3 plate 8)	Short duration crop with medium sized grains. Grown well in short of moisture. Rice is used as raw rice.
18	Gowri, Jaya, IR – 64, IR –8, MTU –1001, Rashi, Jyothi, Shakthi, Intan massoori (small grains)	New/old hybrid with bigger grains needs application of chemical fertilizers gives good yield and can be used as boiled rice but not much nutritious.

Photo sheet 4.1.3 Traditional paddy (Oryza sativa) crops

Plate 1.Chintamani

Plate 2.Adenu Kelte

Plate 3.Kari Bhatta/ Kari kagga

Plate 4.Rathnachuda

Plate 5. Bili Pandya

Plate 6. Jaddu Bhatta

Plate 7.Zigoratogya

Plate 8.75 days

Plate 9. Kamadhari

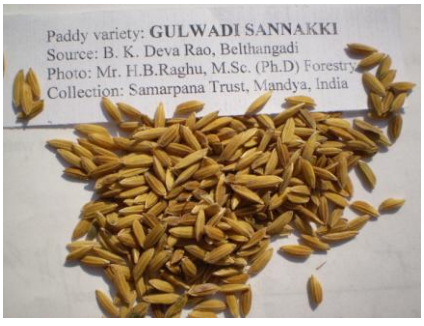


Plate 10.Gulwadi sannakki

Plate 11. Rajakayme

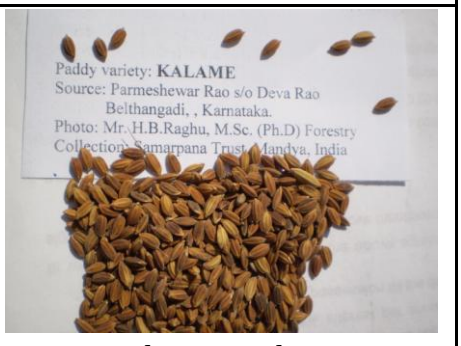


Plate 12.Kalme

4.2 PULSE CROPS

Pulses are important food crops due to their high protein and essential amino acid content. Pulses are annual leguminous crops yielding from 1 to 12 grains or seeds of variable size, shape and colour enclosed in a pod. They are used as food and as well as animal feed. The term "pulses" is limited to crops harvested solely for dry grain, thereby excluding crops harvested green for food (green peas, green beans, etc.) classified as vegetable crops. Some pulse crops are mainly used for oil extraction (e.g. soybean and groundnuts) and some leguminous crops (e.g. seeds of clover and alfalfa) are used exclusively for sowing purposes. In addition to their food value, pulses play an important role in cropping systems because of their ability to fix atmospheric nitrogen enriching the soil. Pulses contain carbohydrates mainly starches (55-65 percent of the total weight); proteins, including essential amino acids (18-25 percent, and much higher than cereals) and fat (1-4 percent). The balance component consists of water and inedible substances.

Pulses are grown as rabi cover crop and not much care is taken for improvement. Not much difference is found among traditional varieties between eco-logical regions, but comparatively improved varieties are grown along the coastal region.

Table 6: Traditional and hybrid pulse crops cultivated in Coastal Karnataka

	Coast		**Inland**		**Foot hills**	
Taluks	**Traditional**	**Hybrids**	**Traditional**	**Hybrids**	**Traditional**	**Hybrids**
Mangalore	4	4	5	4	5	4
Bantwala	5	5	4	4	7	4
Belthangadi	6	6	5	4	7	4
Udupi	7	4	7	3	7	4
Karkala	8	6	8	4	8	4
Kundapur	8	5	8	4	8	4
Bhatkal	7	6	6	4	6	4
Honnavar	7	4	7	4	7	4
Ankola	6	5	6	4	7	4
Kumta	7	4	7	4	7	4
Karwar	7	6	6	4	6	4
TOTAL	***9***	***8***	***10***	***6***	***8***	***5***

Note: Traditional varieties of pulses cultivated in coastal, inland and foothill regions are 9, 10 and 8 respectively. Hybrid varieties of pulses cultivated in coastal, inland and foothill regions are 8, 6 and 5 respectively. Cultivation of traditional and hybrid varieties in each coastal taluks varies depending on the climatic and edaphic factors besides the choice of crop varieties available to farmer.

There are 12 traditional varieties of pulse crops and 8 HYV shown in 4.1.2. Pulse crop diversity is higher in coastal and inland ecological regions than foothill region as given in table 6. Highest diversity of traditional pulses is more in Kundapur and Karkal taluks of Udupi district. Higher diversity of hybrid pulses has been documented in coastal ecological region.

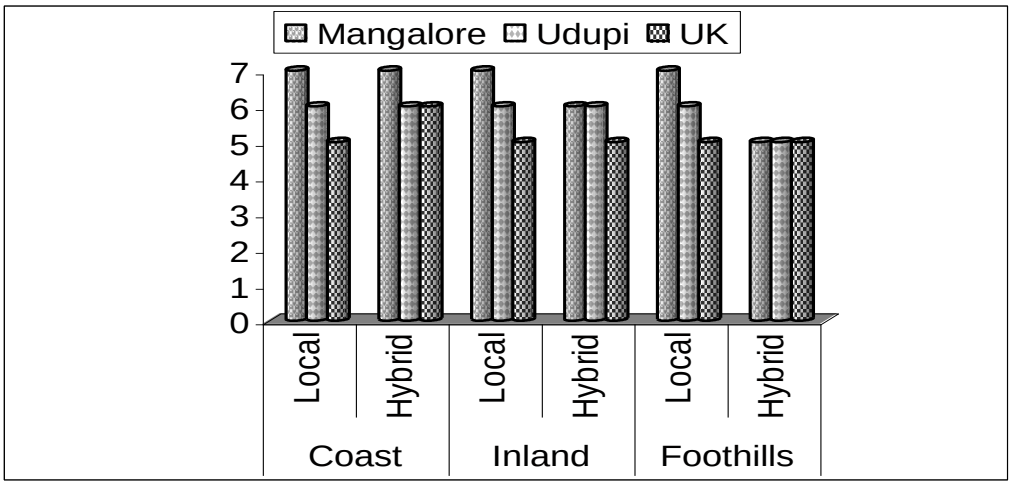
Table 7: Local and hybrid pulse crops cultivated in Coastal Karnataka

Eco region	**Varieties**	**Mangalore**	**Udupi**	**Uttara Kannada**	***TOTAL***
Coast	Local	7	6	5	***9***
	Hybrid	7	6	6	***8***

Inland	Local	7	6	5	***10***
	Hybrid	6	6	5	***6***
Foothills	Local	7	6	5	***8***
	Hybrid	5	5	5	***5***

Diversity of traditional pulse crops is highest in Dakshina Kannada district followed by Udupi district and Uttara Kannada district as given in table 7. Diversity is not much among ecological regions and also among the coastal districts as shown in fig.2. Only few types of pulses are generally grown as rabi crops. Variability among them is considerably high. Only green coloured green gram can be seen in Uttara Kannada but only black coloured green gram is grown in Kundapur taluk of Udupi district. Where as in other parts of Udupi and Dakshina Kannada, both the varieties of green grams are grown. Small sized local variety and big sized improved varieties of Black gram are found in the region. White, light reddish brown and red coloured Cowpea are cultivated.

Figure 2: Graphical representation of local and hybrid pulse crops cultivated in Coastal Karnataka



Generally, diversity of pulse crops is low in the region but more numbers of varieties are found in Dakshina Kannada district. Improved varieties of pulse crops are grown along the coastal ecological region than in other regions. Bavade is one of the local pulses resembling cowpea having small grains. Grain size and total yield of improved varieties of Cowpea, black gram and green gram have been documented.

4.2.1 Description of pulse crops

Sl. No.	Scientific name	Local name	Description
1	*Vigna unguiculata*	Alasande (photo sheet 4.2.2 plate2)	Local variety with red, small and white, big grains with medium yield, not much insect or disease attack noticed. Provide good dry fodder for cattle. Recently, Manila hybrid has been introduced to increase the yield of fodder.
2	*Dolichos biflorus*	Huruli kalu	Local variety with medium yield, not much insect or disease attack noticed. Provides good dry fodder for cattle. Local small grains and Madwale big grains were grown. Medium yield, not much insect or disease attack noticed. Provide good dry fodder for cattle.

3	*Phaseolus radiatus*	Hasiru kalu	Hasiru: Small green grains, Nelapadange: Big, green grams, Kappu: In Kundapur district only black coloured grains of Green gram were used and in Dakshina Kannada both black and green coloured green grams are grown.
4	*Phaseolus mungo*	Uddu/ Black gram (photo sheet 4.2.2 plate5)	Local varieties with small grains and hybrid varieties yield bigger grains**.**
5	*Sesamum*	(photo sheet 4.2.2 plate4)	Black grains are grown for domestic purpose.
6	*Vigna spp.*	Bavade (photo sheet 4.2.2 plate1)	Small quantity is grown for domestic use for both human and cattle consumption.
7	*Arachis hypogea*	Shenga	Small seeds with lower yield, dry fodder for cattle.
8	*Arachis hypogea*	Gejje shenga	Bigger size, light coloured grains with higher yield.
9	*Glycine max*	Soya avare (photo sheet 4.2.2 plate 3)	Introduced and only few farmers intitated to grow hybrids. Good quality and yields better.

Photo sheet 4.2.2: Pulse crops

*Plate 1. Vigna spp. (*Bavade*)*

*Plate 2.Vigna unguiculata (*Bilialsende*)*

*Plate 3.Glycine max (*Soya bean*)*

*Plate 4.Sesamum orientale (*Sasuwe*)*

Plate 5.
*Phaseolus mungo (*Uddinakalu*)*

4.3 MANGO

Mango is a tropical fruit belonging to the genus *Mangifera* which includes about 30 species under the family Anacardiaceae. Mango is the apple of tropics and one of the most commonly edible fruits in the tropical countries and also around the world. Mango retains a special place in the culture of South Asia where it is being culivated since hundreds of years. Reference to mango fruit as the "food of gods" can be found in Hindu Vedas. Leaves are used for decoration in Hindu rituals marriages, festivals and religious ceremonies. The fruit is highly nutritious containing about 15% sugar, up to 1% protein and significant amount of vitamins A, B and C. India is by far the largest producer of mango with an area of 16,000 km² accounting for an annual production of 10.8 million tonnes, sharing 57.18% of the total world production. Within India, the southern state of Andhra Pradesh is the largest producer of Mango having 350,000 hectares of area under mango cultivation (2004 data). The most renowned variety of Indian Mango is known as the Alphonso, which was locally known as the Hapoos. Apart from consumption of fresh fruits there is good market for mango juice and other products. India is the biggest player in the market catering Alphonso variety of mango to the high end of the market and Totapuri variety to the lowest end. Raw mangoes are used in making pickles and condiments due to its peculiar sweet and sour taste like that of Appemidi variety. Dried and powdered raw mango is also used as condiment in the region.

The quality of fruit is based on the scarcity of fiber and minimal turpentine taste. The pulp of mango is peach like and juicy with more or less numerous fibers radiating from the outer coat of the single large kidney-shaped seed. Fibers are more pronounced in fruits grown with hard water and chemical fertilizers. The flavor is pleasant and the pulp is rich in sugars and acids. The seed may either have a single embryo, producing one seedling, or polyembryonic producing several seedlings that are identical but not always true to the parent type.

The diversity of fruits in the region is high. They can be found in domesticated and wild ecosystems. Mention may be made of the wild ‘appemidi’ mango variety, which is favored for pickling. Diversity of ‘appemidi’ variety of mango is found more in Taluks of Uttara Kannada and Sagar taluk of Shimoga district. Ankola (13) and Kumta (16) taluks have recorded the highest variety of appemidi. Diversity of traditional mango (17 varieties) and appemidi (21 varieties) is high in inland coastal eco-region as shown in table 8.

Table 8: Mango varieties cultivated in Coastal Karnataka

	Coast			Inland			Foot hills		
Taluks	**Traditional**	**Appemedi**	**Hybrids**	**Traditional**	**Appemedi**	**Hybrids**	**Traditional**	**Appemedi**	**Hybrids**
Mangalore	7	9	6	12	5	9	11	4	6
Bantwala	8	4	8	10	5	8	10	4	7
Belthangadi	8	4	8	11	4	5	9	5	5
Udupi	7	4	8	9	5	7	9	4	7
Karkala	5	5	12	15	6	13	10	5	9
Kundapur	8	5	9	12	5	9	9	4	9
Bhatkal	10	6	8	11	6	8	10	5	9
Honnavar	9	8	9	9	10	9	10	7	8
Ankola	11	13	11	10	14	10	10	10	10
Kumta	11	16	10	10	17	9	9	15	9

Karwar	8	7	7	10	9	8	10	8	8
TOTAL	***14***	***19***	***15***	***17***	***21***	***16***	***14***	***18***	***12***

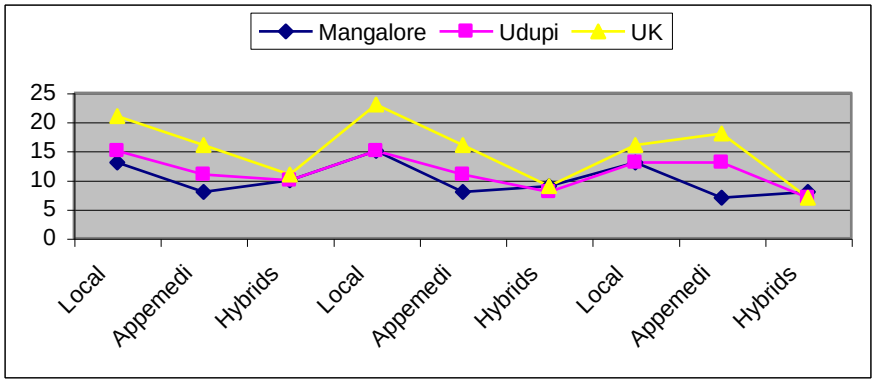
Note:

- *Traditional varieties of mango cultivated in coastal, inland and foothill regions are 14, 17, and 14 respectively.*
- *Appemedi varieties of mango cultivated in coastal, inland and foothill regions are 19, 21 and 18 respectively.*
- *Hybrid varieties of mango cultivated in coastal, inland and foothill regions are 15, 16 and 12 respectively.*

Cultivation of traditional, appemedi and hybrid varieties in each coastal taluks varies depending on the climatic and edaphic factors besides the choice of crop varieties available to farmer.

Although Mango is considered as the king of fruits, higher diversity of local varieties is found in the region. Higher diversity of mango is found in Uttara Kannada district followed by Udupi district and Dakshina Kannada districts as shown in fig. 3.

Figure 3: Graphical representation of mango varieties cultivated in Coastal Karnataka



Local mango varieties with sour taste are also used for making pickle apart from Appemedi. High variability is found among local varieties. Some varieties are very small having sweet taste while other varieties are having less pulp and few are having higher fiber content. But majority of them are having distinct taste and odour. Hence, some varieties are used for preparing curry and some varieties are used after storage.

Table 9: Mango varieties cultivated in Coastal Karnataka

Districts	**Local**	**Appemedi**	**Hybrids**	**Local**	**Appemedi**	**Hybrids**	**Local**	**Appemedi**	**Hybrids**
Mangalore	13	8	10	15	8	9	13	7	8
Udupi	15	11	10	15	11	8	13	13	7
UK	21	16	11	23	16	9	16	18	7
TOTAL	***14***	***19***	***15***	***17***	***21***	***16***	***14***	***18***	***12***

Even though the diversity of improved mango varieties found along the coastal region is higher (15 varieties), the traditional mango varieties (17 varieties) are also given importance in inland eco-region for their unique taste and fragrance as given in table 9. There are 17 traditional mango varieties, (8 local varieties and 9 varieties of major appemidi) excluding subtype like Ananthabhattana appemidi and there are 11 improved varieties being grown in the region as shown in 4.3.1.

4.3.1 *Description of mango varieties (Mangifera indica)*

Sl. No.	Local name	Description
1	Kari ishad (photo sheet 4.3.2 plate 9)	Very sweet, fragrant, small stone with more pulp. Famous in the region.
2	Bili ishad (photo sheet 4.3.2 plate 7)	Long, big fruit and very sweet, very specific to Kumta and Ankola region.
3	Manibhatta ishad	Very famous in the region, with two colors i.e., white and light yellow. Ripe and both unripe fruits are sweet in taste.
4	Poth ishad	Small fruit with round shape, fruits are stiff and hard; yield is very good. Sweet fruit with long keeping quality.
5	Appemidi	Sour taste, fragrant green fruit best suited for pickles. **Sone appe** (plate 16) **-** Sap from petiole is very fragrant and it is added to the pickle jar as a preservative. It gives distinct and characteristics fragrance. **Jirige appe** (plate 20) – Smells like jirige (cumin), **Gund appe** (plate 18) – Round type, **Kanchuli appe** (plate 14) – Sour in taste, round small white **Udda Appe** (plate 17) - round small black. **Anantha Bhattana appe** (plate 16), Variety is specific to a region with distinct aroma and taste.
6	Chalti	Small fruit with light sour and sweet taste used for making chatni and other traditional food. (plate 2). **Unde chalti** (plate 1): Round, small fruit with sour taste. Raw fruit is used for pickle making. **Midi mavu** (plate 3): Raw, young fruit is used pickle making. **Chandrika mavu** (plate 5): Local variety of mango. Fruit is big, sweet and specific aroma and taste after ripen.
7	Banganapalli, Apoose (photo sheet 4.3.2 plate 8), Mallika (plate 6), Malagove, Neelum (plate 4), Totapuri (plate 19), Kalappadi (plate 12)	Improved varieties with good yield. But less resistant to pest and diseases.

Photo sheet 4.3.2 Mango (Mangifera indica) varieties

		
Plate 1. Unde Chalti	Plate 2.Chalti mavu	Plate 3.Midi mavu
		
Plate 4. Neelum	Plate 5. Chandrika mavu	Plate 6.Mallika
		
Plate 7.Bili ishad	Plate 8.Benet apoosu	Plate 9.Kari ishad

Plate 10 Neelum

Plate 11.Jaddi appe

Plate 12.Kalappadi mavu

Plate 13.Ananth Bhat's appe

Plate 14.Kanchuli appe

Plate 15.Yhudguna appe

Plate 16.Sone appe

Plate 17.Udda appe

Plate 18.Gund appe

Plate 19.Tothapuri mavu

Plate 20.Jirige appe

4.4 BANANA

Banana, the world's most popular fruit is found in the region of Malaysia. By way of curious visitors, banana has been brought to India. Banana plant is not a tree but the world's largest herb "Bananas are eaten raw, either the whole fruit or cut into slices and mixed with sugar, salt, jaggery cream, wine, juice, other fruits, etc. They are also roasted, fried or boiled, and are made into fritters, preserves, and marmalades." The nutritional value of banana shows that it is the healthiest fruit consumed as food. The fruit, when cooked, rates slightly higher on the nutritional scale in vitamins and minerals but similar to the banana in protein and fiber content. High in iron, banana can stimulate the production of haemoglobin in the blood when consumed. This unique tropical fruit is extremely high in potassium yet low in salt, making it the perfect food for helping to beat the blood pressure. Banana contains tryptophan, a type of protein that the body converts into serotonin – known to make you relax, improve your mood and generally make you feel happier. Bananas are high in B vitamins that help calm the nervous system. Vitamin B6 regulates blood glucose levels, which can affect your mood. The high levels of Vitamin C, A1, B6 and B12 are also found along with potassium and magnesium in them. This composition helps the body recover from the effects of nicotine withdrawal.

Banana is one of the chiefly available fruits at reasonable cost. This is the fruit that is commonly used by majority of people all over the world. This is the cheaply available nutrient supplementing fruit source. Higher diversity of traditional (16) and hybrid (9) varieties recorded in inland coastal eco-region than in other regions coupled with cultivation of hybrids is found to be less in foothill region as shown in table 10.

Table 10: Traditional and hybrid varieties of banana cultivated in Coastal Karnataka

	Coast	**Inland**		**Foot hills**	
Taluks	**Traditional**	**Hybrids**	**Traditional**	**Hybrids**	**Traditional**	**Hybrids**
Mangalore	7	5	9	4	8	2
Bantwala	8	4	7	5	9	4
Belthangadi	9	5	8	5	10	6
Udupi	9	6	10	6	10	6
Karkala	14	5	10	6	10	5
Kundapur	10	4	14	5	9	6
Bhatkal	17	4	10	7	12	5
Honnavar	10	4	10	6	10	6
Ankola	11	4	10	7	8	5
Kumta	9	3	8	7	8	5
Karwar	4	4	7	6	4	3
TOTAL	***20***	***6***	***16***	***9***	***12***	***6***

Note: Traditional varieties of banana cultivated in coastal, inland and foothill regions are 20, 16 and 12 respectively. Hybrid varieties of banana cultivated in coastal, inland and foothill regions are 6, 9 and 6 respectively. Cultivation of traditional and hybrid varieties in each coastal taluks varies depending on the climatic and edaphic factors besides the choice of crop varieties available to farmer.

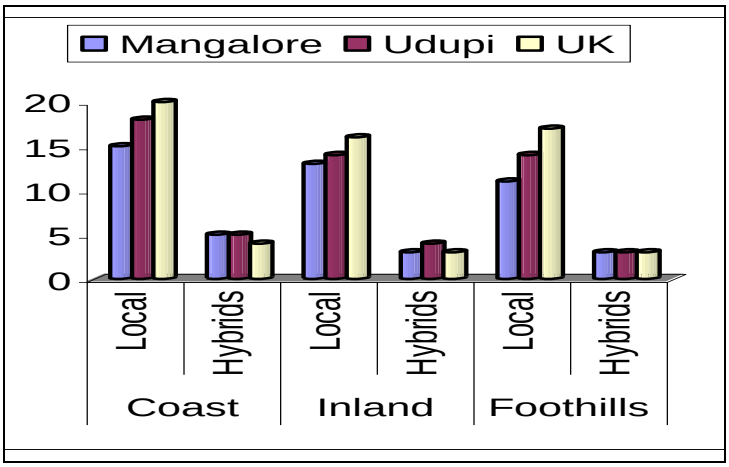
Banana is widely cultivated in the region; the notable varieties are Boodibale, Chipsbale, Kari bale, Mitga, Mysore Mitga, Nenibale, Rasabale, Pachebale and Sakkarebale. Onbale/Shanbale/Shilanti bale are used as vegetable and for preparation of chips. Wild

banana with black seeds is having high medicinal value. Sakkarebale is very sweet and Putbale is short, small and tasty variety of fruit. Red coloured Nendra bale has been introduced from Kerala and it is used for making fried items. Higher diversity of traditional banana is found in Uttara Kannada district followed by Udupi district and Dakshina Kannada district as shown in the Fig. 4 and table 11.

Table 11: Local and hybrid varieties of banana cultivated in Coastal Karnataka

Districts	**Coast**		**Inland**		**Foothills**		***TOTAL***	
	Local	**Hybrid**	**Local**	**Hybrid**	**Local**	**Hybrid**	***Local***	***Hybrid***
DK	15	5	13	5	11	6	***16***	***7***
Udupi	18	5	14	6	12	6	***19***	***7***
UK	20	4	16	8	13	5	***20***	***8***

Figure 4: Graphical representation of local and hybrid varieties of banana cultivated in Coastal Karnataka



Higher diversity of traditional (20) and hybrid (8) varieties recorded in Uttara Kannada district than in Udupi and Dakshina Kannada districts has been given in table 11. The trend of higher diversity has been found in Uttara Kannada followed by Udupi and Dakshina Kannada districts as shown in fig.4. During the last ten years or so due to spread of "Bunchy-top disease" the yield of banana is on the decline. Improved Cavendish variety has been introduced as commercial variety in the recent past. There are 28 banana varieties being grown in the region as documented in 4.4.1.

4.4.1 Description of Banana Varieties (Musa paradisiaca)

Sl. No.	**Local name**	**Description**
1	Kari bale (photo sheet 4.4.2 plate 2)	Sweet with light sour, thick skin and tasty fruit with longer shelf life.
2	Bargi karibale (photo sheet 4.4.2 plate 8)	Very sweet, thin skin and tasty fruit with longer shelf life.
3	Bidiri mitga (photo sheet 4.4.2 plate 11)	Very rare fruit like elakki, petiole is long, long fruit, small fruit and very sweet.
4	Hooru mitga (photo sheet 4.4.2 plate 1)	Very sweet, thin skin and tasty fruit with longer shelf life. Locally famous and in high demand.

5	Mysore mitga (photo sheet 4.4.2 plate 5)	Slightly sour in taste, thin skin and tasty fruit with longer shelf life.
6	Bud bale (photo sheet 4.4.2 plate 4)	Light sour & sweet at ripe.
7	Onbale (photo sheet 4.4.2 plate 9)	Unripe fruit is used as vegetable.
8	Pachbale (Cavendis) (photo sheet 4.4.2 plate 3)	Sweet, long, big fruit, good taste & high yielding
9	Karbale (photo sheet 4.4.2 plate 7)	Medium sized round fruit with long keeping quality. Even fruit covers turns black, fruit is in good condition and tasty.
10	Shanbale	Big green fruit used as vegetable and also for fried items
11	Sakrebale	Medium sized fruit with very sweet taste.
12	Yelakki	Small to medium sized fruit with tasty fruits with moderate yield

Photo sheet 4.4.2 Musa paradisica varieties (Banana)

		
Plate 1. Mitga bale	Plate 2. Kari bale	Plate 3. Cavendis
		
Plate 4. Boodbale	Plate 5. Mysore Mitga	Plate 6. Yelaki
		
Plate 7. Karbale	Plate 8. Bargi bale	Plate 9. Onbale
		
Plate 10. Shanbale	Plate 11. Mitga	Plate 12. Sakrebale

4.5 OTHER FRUITS

- **JACK**

The natural diversity among jackfruit is very high. It is used as table fruit and also as vegetable. Ripe fruits have distinct fragrance and taste. Edible, rigid and hard fruits are locally called as bakke and variability among bakke are known as Rudra bakke, Chandra bake and Bili bakke. Edible soft fruits are called Thulve or Imba and also found Areimba or Arethulve. The unripe fruits are used as vegetable. The unripe *Artocarpus lakucha* fruits are sour in taste. The fruits are harvested, cut into halves, dried in sunlight, stored and used as souring agent in the preparation of food. Breadfruit *Artocarpus insis* is used as vegetable. Higher traditional (41 varieties) fruit diversity has been recorded along the foothill region than in other regions but the introduction of improved varieties (18 varieties) recorded along the coastal ecological region is shown in table 12.

Table 12: Traditional and hybrid fruit crops grown in Coastal Karnataka

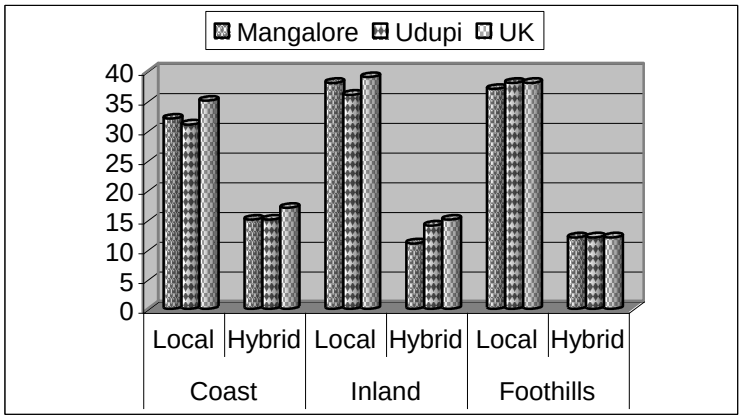
Taluks	Coast		Inland		Foot hills	
	Traditional	**Hybrids**	**Traditional**	**Hybrids**	**Traditional**	**Hybrids**
Mangalore	31	12	33	9	36	7
Bantwala	33	9	30	10	37	8
Belthangadi	31	10	36	11	36	9
Udupi	28	10	31	9	33	8
Karkala	29	12	30	10	30	8
Kundapur	31	11	31	10	31	9
Bhatkal	33	12	32	12	31	7
Honnavar	27	13	33	10	36	9
Ankola	34	12	31	9	33	8
Kumta	29	13	29	8	34	8
Karwar	28	11	29	12	32	9
TOTAL	***36***	***18***	***39***	***17***	***41***	***12***

Note: Traditional varieties of fruit crops (jack, sapota, pine apple, narale, etc) cultivated in coastal, inland and foothill regions are 36, 39 and 41 respectively. Hybrid varieties of fruit crops cultivated in coastal, inland and foothill regions are 18, 17 and 12 respectively. Cultivation of traditional and hybrid varieties of fruit crops in each coastal taluks varies depending on the climatic and edaphic factors besides the choice of crop varieties available to farmer.

Table 13: Local and hybrid fruit crops grown in Coastal Karnataka

Districts	Coast		Inland		Foothills		*TOTAL*	
	Local	**Hybrid**	**Local**	**Hybrid**	**Local**	**Hybrid**	***Local***	***Hybrid***
DK	32	15	38	11	37	12	***38***	***17***
Udupi	31	15	36	14	38	12	***39***	***16***
UK	35	17	39	15	38	12	***42***	***19***

Figure 5: Graphical representation of local and hybrid fruit crops grown in Coastal Karnataka



Highest diversity of local and hybrid fruits other than mango and banana has been documented in Uttara Kannada than Udupi and Dakshina Kannada districts. Same trend was also noticed among other coastal districts also as shown in fig. 8. There are numerous varieties of wild fruits that are used by forest dwellers. *Carissa carandus* is one of the most nutritious fruits occurring in wild and other fruits such as wild Kokum, Uppage, Jujube, Black berry (Neralu), Gooseberry etc are also common. Brick red coloured fruit Amtrubale is the local pineapple variety having spinous outer surface. Dr. Soans of Mudbidre has introduced the exotic fruits like Rambutan, Mangosten and gumless jack. These fruits have become popular in the region. Totally around 50 species of fruit yielding plants have been documented after conducting field survey as described in table 4.5.1. These are on the decline due to lack of adequate protection and decrease in forest density.

4.5.1 Description of other fruit crops

Sl. No.	Scientific name	Local name	Description
1	*Artocarpus heterophyllus*	Bakke halasu (photo sheet 4.5.2 Plate 4), Chandra bakke, Rudra bakke.	Jackfruit with rigid fruit even at ripe. Ripe fruits are consumed.
2	*Artocarpus heterophyllus*	Amble halasu (photo sheet 4.5.2 Plate 3)	Local variety of jackfruit. Half soft & half stiff type; full soft type is very soft at ripe, knife is not required to open the fruit. Rarely used as fruit and unripe fruit is used as vegetable, chip making etc.
3	*Anacardium occidentale*	Godambi	Local variety, nut size is small. Ullal and Vengurla varieties are having bigger seeds.
4	*Cucumis melo var. Melo*	Karbuja hannu	Nutritious and tasty pulp, used in the preparation of juice during Ramanavami festival.
5	*Garcinia indica*	Panapuli (photo sheet 4.5.2 Plate 8 & 9)	Red fruit juice reduces obesity and has medicinal value. Yellow/White fruits have higher medicinal value.
6	*Garcinia gummigatta*	Uppage	Used as souring agent, reduces obesity and have medicinal value.
7	*Ananas comosus*	Amtrubale (local pineapple) (photo sheet 4.5.2 Plate 7)	Spines on fruit surface, sour and sweet in taste. Have high medicinal value.

8	*Annona reticulata*	Ramphala (photo sheet 4.5.2 Plate 6)	More pulp with light sour and sweet taste.
9	*Annona reticulata*	Jamble fruit	Small spines on all parts including leaves and fruits are sweet.
10	*Citrullus lunatus*	Kallangadi hannu	White patches on the surface, pulp is reddish, watery and sweet.
11	*Syzigium cumini*	Kuntu nerale	Small, round fruit with little pulp.
12	*Syzigium cariyophyllatum*	Jogi hannu	Round, small, tasty fruit. Plant has medicinal value.
13	*Syzigium gardneri*	Nerale	Medium sized, Round, small, tasty fruit. Plant has medicinal value.
14	*Syzigium cumini*	Jam nerale	Big long fruit with good quantity of pulp.
15	*Carica papaya*	Parangi hannu	Local and Taiwan variety**:** Small fruit with good quantity of pulp containing viable seeds. Wild fruit is more nutritious than hybrids.
16	*Psidium gujava*	Peralu hannu	Local variety fruit is small and sweet containing seeds. Hybrid variety has less number of soft seeds and more pulp. There are in red and white coloured fruits both in local and hybrid varieties.
17	*Achras zapota*	Sapota hannu	Local variety - Small - Medium sized round sweet fruit. Hybrid like Cricket ball – Variety is oblong, bigger in size and sweet.
18	*Artocarpus lackucha*	Vatehuli	Unripen fruits opened and cut in to thin slices, dried and stored for use as souring agent.
19	*Flucortia montana*	Sampige hannu	Red coloured oblong edible sweet fruits. These nutritious fruits are available during summer.
20	*Mimosops elengi*	Pagade mara	Edible sweet fruits available during summer. Flowers are fragrant containing nectar, which is used to prepare traditional wine by folk women.
21	*Canthium parviflorum*	Kare hannu	Yellow coloured sweet fruits; turns brown after ripening. Pet fruits of children during summer season.
22	*Zizyphus juzuba*	Bare hannu (photo sheet 4.5.2 Plate 1)	One of the major NTFPs occurring during summer season. Sweet and nutritious fruit.
23	*Gardenia gummifera*	Bukke hannu	One of the major NTFPs occurring during summer season. Sweet, nutritious fruit. Gum is used for treating constipation.
24	*Carissa caranda*	Kavale kai (photo sheet 4.5.2 Plate 2)	Small sized fruits from spiny shrub. Green fruit turn brick red when ripe with high iron content.
25		Lichy fruit (photo sheet 4.5.2 Plate 5)	Introduced plants with attractive coloured, nutrient fruit.
26	*Spondia pinnata*	Amte kai (photo sheet 4.5.2 Plate 10)	Green medium sized sour fruits used fro pickle making.

Photo sheet 4.5.2: Traditional fruit crops

*Plate 1. Zizyphus mauritiana (*Bhugari*)*

*Plate 2. Carissa caranda (*Kavale Kai*)*

*Plate 3. Artocarpus heterophyllus (*Amble halasu*)*

*Plate 4. Artocarpus heterophyllus (*Bakke halasu*)*

Plate 5. (Lichy fruit)

Plate 6. Annona squmosa

Plate 7. Ananas comosus (Amthrubale)

*Plate 8. Garcinia indica (*Kempu Murugalu*)*

*Plate 9. Garcinia indica (*Haladi murgalu*)*

Plate 10. Spondias pinnata