



GOVERNMENT OF KARNATAKA

# “BIODIVERSITY OF KARNATAKA” At a Glance



## **KARNATAKA BIODIVERSITY BOARD**

(Forest, Ecology and Environment Department)

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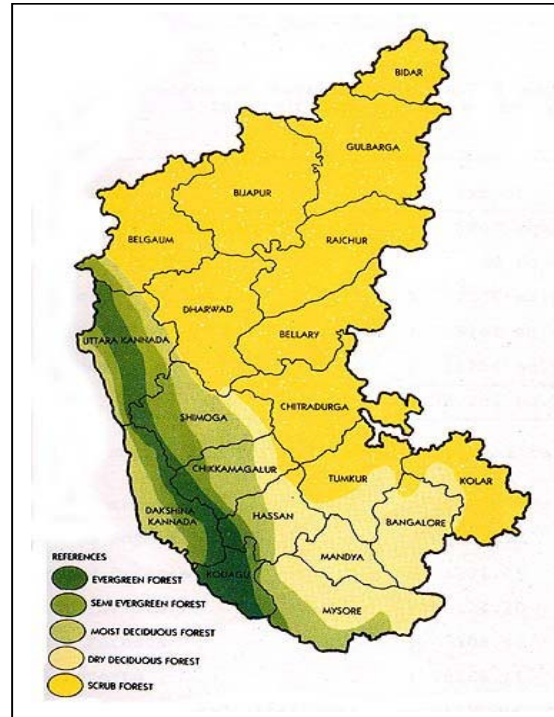
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# BIODIVERSITY OF KARNATAKA

## Introduction

Karnataka, one of the Southern states of India has 3.83 Million ha of recorded forest area which is around 20 percent of its geographical area. Karnataka is endowed with most magnificent forests in the country ranging from majestic evergreen forests of the Western Ghats to the scrub jungles of the plains. The Western Ghats of Karnataka are one of the 25 global priority hotspots for conservation and one of the two on the Indian subcontinent. Several economically important species such as Sandalwood, Rosewood, Teak, White cedar grow naturally in these forests. Karnataka forest is endowed with rich wildlife, harbors 25 percent of the elephant population of India, 10% of the Tiger population. The state has 5 National parks and 21 sanctuaries comprising about 17.3% of total forest area as protected area for wildlife and biodiversity. The state ranks 4<sup>th</sup> among all the state and union territories in respect of area under tree cover.



**Karnataka Forest**



**Evergreen Forest-Western ghats**

The State of Karnataka is a part of highly biodiversity rich regions of India. The Western Ghats of Karnataka is one of the mega biodiversities of the world. The State is endowed with great diversity of climate, topography and soil. Karnataka has great diversity of species, including the human being which has co evolved since centuries. Geographically the State can be divided into three major zones. With the Western Ghats (Sahyadri) forming a major water divide, there are short and swift flowing rivers in the west draining into the Arabian sea. Notable among them are Sharavati, Kali, Netravati, Bedthi/Gangavalli, Aghanashini, Varahi and Chakra. To the east of the major divide, flow the river Krishna and Cauvery. A major part of the upstream of river Krishna and its tributaries Tungabhadra, Ghataprabha, Malaprabha, Bhima and Vedavati flow through northern Karnataka, pass through Andhra Pradesh before joining the Bay of Bengal. The Cauvery river in the south flows down the eastern slopes of the ghats, passes through Tamil Nadu before joining the Bay of Bengal. The main tributaries are Hemavathi, Kabini, Arkavati, Shimsha, Palar, Uttara and Dakshina Pinakini, Manjira and Karanja are the only



tributaries of river Godavary found within the State boundary. **Karnataka consists of 3 regions- 1. Coastal Zone, 2. The Western Ghats, 3. The Eastern Plains.**

### 1. Coastal Zone

Karnataka coastline extends over a length of 320 kilometers with numerous river mouths, lagoons, bays, creeks, cliffs, sand dunes and long beaches. Karnataka has no major delta formations. The shelf off Karnataka has an average width of 80 kilometers and the depth of shelf break is between 90 and 120 meters. There are 26 estuaries with more than 70000 ha water spread area and 8000 ha of brackish water area, making the 3 coastal districts of Karnataka very rich in marine, estuarine and riverine biodiversity. 14 rivers which originate in Western ghats run westwards and join the Arabian sea. Karnataka Coastal soil is a mixture of laterite rock and clay.



**Brahminy Kite**



**Mangrove Forests**



**The Walking trees – Rhizophora Mucronan still roots**

There are few islands of the coast such as St.Mary's island, 4 kilometers from Malpe. Coastal areas are some of the most productive and important habitat of the biosphere including estuaries, backwaters and coastal wetlands. There are 14 coral species and 4 sponge species found in this region such as *Dendrophyllion* Sp, *Turbinana* Sp, *Goniastrea pectinatu* che. Small gaint clams (*Tridacna maxiona*) are protected under the Indian wildlife protection Act. There are about 62 phytoplankton; 78 species of sea weeds (*sangassam ilicifolium*), 2 species of sea grass, 115 zooplankton such as *Acartia clausii*, *Acrocalanus gibber*, *Euphausia diomedeeae*, *Stylocheiron armatum* etc are observed along the Karnataka coasts apart from these 234 species of *Mollusce* out of which 3 are threatened such as *Tridacna maxima*, *Lambis chiragra* and *placenta. placenta*. 33 species of shrimps were first recorded from Karnataka coasts recently. 103 species of crabs, 5 species of star fish, 2 species of sea urchius, one species of sea cucumber have been observed along the coasts. 390 marine fish species, 3 species of sea turtles, 4 species of whales, 4 species of dolphins are commonly seen along the

coasts. Existence of rich fringing coral reef ecosystem surrounding the Nethrani Island can be observed.

The coast has 14 species of mangroves belonging to 8 families. The Mangroves species available in the Coastal Zone of Karnataka are *Rhizophora mucronata*, *Acanthus ilicifolius*, *Acrostichum aureum*, *Aegiceras corniculatum*, *Avicennia marina*, *Avicennia officinalis*, *Bruguiera cylindrical*, *Humanizenra*, *Racemosa*, *Excoecaria*, *Agallocha*, *Protersia*, *Coaretata*, *Bruguiera*, *gymnorrhiza*, *Rhizophora apiculata*, *Sonneratia alba* etc.

### Mangroves in Karnataka

Karnataka has a coastline of over 320 kilometers. Fourteen rivers and several small rivulets, which originate in the Western Ghats cut across the Coast to join the Arabian Sea. Towards the coast, the salt water tides from the sea travel several Kilometers interior through the river mouths providing congenial habitats for mangroves. Most Mangroves are of the fringing type in linear formations along the river or estuarine banks. Where the estuaries are wider, especially in Swarna Sita-Kodi, Gangoli, (towards the mouth of Haladi-Chakra-Kollur rivers), Aghanashini and Kali there are several remarkable locations for mangroves.



**Acanthus ilicifolius**



**Bruguiera gymnorrhiza in flowers**

Mangrove swamps develop only where coastal physiography and energy conditions are favorable. Mangroves develop best in the region, experiencing abundant rainfall, evenly distributed throughout the year and when the climate is very much regular. The Coastal Karnataka is a region of high humidity. The rainfall here varies from 2500mm to slightly over 3000mm, most of it is seasonal during June-September. Karnataka Coast soil is a mixture of laterite rock and clay.

### Mangroves Species of Karnataka

Sl. No.	Family	Species
1	<b>Acanthaceae</b>	<i>Acanthus ilicifolius</i>
2	<b>Combretaceae</b>	<i>Lumnitzera racemosa</i>
3	<b>Euphorbiaceae</b>	<i>Excoecaria agallocha</i>
4	<b>Myrsinaceae</b>	<i>Aegiceras corniculatum</i>
5	<b>Poaceae</b>	<i>Porteresia coarctata</i>
6	<b>Rhizophoraceae</b>	<ul style="list-style-type: none"> <li>◆ <i>Bruguiera cylindrical</i></li> <li>◆ <i>Bruguiera gymnorrhiza</i></li> <li>◆ <i>Kandelia candel</i></li> <li>◆ <i>Rhizophora apiculata</i></li> <li>◆ <i>Rhizophora mucronata</i></li> </ul>
7	<b>Sonneratiaceae</b>	<ul style="list-style-type: none"> <li>◆ <i>Sonneratia alba</i></li> <li>◆ <i>Sonneratia caseolaris</i></li> </ul>
8	<b>Verbenaceae</b>	<ul style="list-style-type: none"> <li>◆ <i>Avicennia marina</i></li> <li>◆ <i>Avicennia officinalis</i></li> </ul>



## 2. The Western Ghats



The Western Ghats one of the 34 biodiversity hotspots of the world is a chain of mountain ranges stretching North-South along the western peninsular India for about 1600 Kms. Western Ghats are the habitats for the elephants and endangered lion tailed macaque. Western Ghats are also known as Sahyadri mountain ranges in Karnataka. It runs North to South along the Western edge of Deccan Plateau. 60% of Western Ghats are located in Karnataka. The average elevation is about 1200 meters MSL and receives rainfall between 3000 and 4000mm. the average annual temperature is around 15°C. The monsoon season runs between June and September.

### Tropical Evergreen Forests in Western Ghats

Forest types found are tropical evergreen, moist and dry deciduous, high altitude sholas, savannas and scrubs. There are over 4500 species of flowering plants (38% endemic) 330 butterflies (11% endemic), 156 reptiles (62% endemics) 508 species birds (4% endemics) 150 mammals (12% endemics) 289 fishes (41% endemics) 135 amphibians (75% endemics) are among the known biodiversity of Western Ghats.

The rich biodiversity coupled with higher endemism can be attributed to the humid tropical climate, topographical and geographical characters. Western Ghats form an important watershed for the entire peninsular India, and is a source of west flowing rivers and three major east flowing rivers. The Western Ghats belong to one of the oldest mountain ranges of the planet; harbor numerous elements of flora and fauna having lineage to the Gondavana land.

The important endemic tree species of the region are *Dipterocarpus indicus*, *Hopea parivflora*, *Myristica fauna*, *Gymnacranthera canarica*, *Vateria indica*, *Pinanga dicksonal* *Semi carpus Kathalekanensis* is one of the lofty evergreen trees which have been discovered for the first time in the Myristica swamps of Western Ghats.

<b>BIODIVERSITY OF KARNATAKA</b>	
➤ Number of Species.....	1.2 lakhs
➤ Flowering plants.....	4500 species
➤ Birds.....	508 species
➤ Mammals.....	150 species
➤ Reptiles.....	156 species
➤ Amphibians.....	135 species
➤ Fishes (marine & brackish water).....	405 species
➤ Fishes (fresh water).....	289 species
➤ Butterflies.....	330 speices
➤ Medicinal plants.....	1493 species which Includes 300 species in commercial use.

**Biological Diversity Act 2002:** The Biological Diversity Act, which came into force in February 2003, aims to promote conservation, sustainable use and equitable sharing of benefits arising from biodiversity resources. National Biodiversity Authority established at Chennai as headquarters is the apex body. The National Biodiversity Authority plays a regulatory role with regard to access to biological resources by foreign citizens and grant of Intellectual Property Rights. It has advisory role in matters relating to the conservation, sustainable use and equitable distribution of biological resources.

Karnataka Biodiversity Board was established during August 2003. The act provides for the establishment of Biodiversity Management Committees at Grampanchayat, Taluk Panchayat, Zilla Panchayat and Municipalities and other local bodies

The State Biodiversity Board advises the state Government on matters relating to conservation of biodiversity, sustainable use of its components, also regulates access of biological resources by Indian Citizens. The act also provides for the documentation of biological diversity and knowledge related to biological diversity at the local body levels.

In Western Ghat of Karnataka important mountain peak are Mullayanagiri, Kudremukh, Pushpagiri, Kemmangundi, Bababudangiri etc. The region has at least 325 globally threatened species available in Western Ghats of Karnataka.

Western Ghats have some of the important protected areas such as Nagarahole, Bandipur, Kudremukh, National Parks, Dandeli, Bhadra, Pushpagiri, Brahmagiri and Talakaveri Wildlife Sanctuaries.

Several economically important species such as *Santalum album*, *Dalbergia Latifolia*, *Tectona grandis*, *Dysoxylon malabaricum* are naturally grown in the forests of Karnataka. The indiscriminate harvesting of NTFP such as *Machilus macarantha* and *Halmaddi* has resulted in significant reduction in its population to a level which poses threat of extinction.

### **Sholas Forests**

Sholas are usually confined to sheltered valleys, hollows and depressions where there is adequate moisture and good drainage. The trees in sholas are evergreen and mostly short boled. There is a marked difference in canopy layers. The main tree species growing in these forests are *Alseodapline semecarpifolia*, *cryptocarya beddonei*, *Gomphandra Cariacea*, *Gordina abtusa*, etc.

Adjoining shola forests the patches of grass lands are found on the higher elevations of the mountain where the wind velocity is very high. *Phoenix loureirii* and *Hypericum mysurense* are common shrubs found scattered in the region



### **The Western Ghats some highlights:**

- One of the biologically richest regions of the world.
- Of the 13,000 species of flowering plants found in India, some 4,500 are found in the Western Ghats. Of these, some 1,500 are unique to the region.
- Wild relatives of many economically valuable plants, like pepper, cardamom ginger, mango, jackfruit, millets, rice, etc. originate in the Western Ghats.
- The Western Ghats is the 'hotspot' of natural evolution.
- The evergreen forest dominated by trees of Cullenia, persea, Dipterocarpus, Diosphyros, Holigarna and Memcydon found only in the Western Ghats.
- The deciduous forests – dominated by Terminalia, Lagerstroemia, preterocarpus, Xylia, Tectona and Anogeissus species are some of the most valuable commercial timber on earth.
- The Western Ghats is a valuable source of bamboo/cane.
- It is home of wildlife in the sub-continent–the last remnant habitat of major animals such as the tiger, leopard, elephant, gaur, lion tailed macaque etc.
- The region is rich in species of birds, amphibians and reptiles.



**Semi EverGreen Forest**

## **Richness and uniqueness of Western ghat of Karnataka**

- ◆ The Western Ghats comprises the mountain range that runs along the west coast of India from the Vindhya-Satpura ranges in the north to the southern tip. The ecosystems of the Western Ghats include the tropical wet evergreen forests, the montane evergreen forests, moist deciduous forest etc. The Shola grassland ecosystems found in the higher reaches of Western Ghats are unique to this region and harbour a number of endemic species.
- ◆ World Conservation Monitoring Centre (WCMC) has identified Western Ghats region as one of the important areas of biodiversity.
- ◆ The varied topographic, climatic and geological factors have made significant contribution to biodiversity. Almost one-third of all the flowering plant species in India are found in this region.
- ◆ The Nilgiri BR spread over three states in Western Ghats was the first BR to be set up in the country.

### **Threat status**

- ◆ In the past, the forests of the Western Ghats had been selectively logged. Large tracts of forests were also converted to agricultural land for monoculture plantations of tea, coffee, rubber, oil palm, teak, eucalyptus, building reservoirs, roads and railways.
- ◆ Over 20% of the original forest cover remains more or less in pristine condition and the remaining is subject to varying degrees of human pressure including large scale collection of fuel wood and NTFPs, Mass tourism, Grazing and forest fires are other concerns.
- ◆ The poverty is rife and economic development is poor in regions adjacent to forests including the PAs. The competing needs of the people residing in the forest fringes lead to frequent human wildlife conflicts.
- ◆ Of the total known fauna, 102 species fall under different categories of threat and of these, mammals (30 species, 21.9%) and amphibians (52 species; 33.3%) are the prominent groups.

### **Wildlife**

The State of Karnataka located in South India has a rich diversity of flora and fauna. The forests support 25% of the elephant population and 10% of the tiger population of India. Many regions are yet unexplored and new species of flora and fauna are found periodically.



**Lion Tailed Macaque**

The Nilgiri biosphere was established reserve in 1986, The Bandipur and Nagarhole National parks were included in the reserve.

In Karnataka there are 5 National Parks and 21 wildlife sanctuaries.

The faunal species found in various forests in Western Ghats region of Karnataka among others includes. Elephant, Gaur, Sambar, Chital Bonnet, Common giant, Tiger, Leopard, Sloth bear, Striped hyena, Indian Pangolin, Indian Chameleon, Geckos, Russell's viper, Common Krait and Indian Python.

The animals in the forest of dry districts include Wolf, Leopard and Pangolin etc. The Blackbucks are found in Ranebennur. Peacocks are being protected in Bankapur Sanctuary and Daroji Wild life sanctuary is famous for Sloth Bears.

### Wildlife population in Karnataka

Tiger	Elephant	Panther	Bear	Wild bear	Deer	Bison	Sambar	Fox
395	6185	817	2324	15760	25850	8484	4998	957

### National parks (5)

Name of the National parks	Area (sq.km)	Season to Visit
Anshi National park	250.00	Nov-jun
Bandipur National Park	874.20	Jun-oct
Bannergatta National Park	104.27	All seasons
Kudremukha National Park	600.32	Dec-May
Nagarahole National Park	643.39	Sept.-Mar

### Sanctuaries (21)

Name of the Sanctuary	Area (sq.km)	Season to Visit
Adichuchanagiri Peacock Sanctuary	0.84	All seasons
Arabithittu Wildlife Sanctuary	13.50	Dec-Feb
Attiveri Bird Sanctuary	2.23	Oct.-Dec
BRT Wildlife Sanctuary	539.58	Oct.-May
Bhadra Wildlife Sanctuary	492.46	Sept.-Mar
Brahmagiri Wildlife Sanctuary	181.80	Jan-Mar
Cauvery Wildlife Sanctuary	102.59	May-Nov
Dandeli Wildlife Sanctuary	475.02	Sept.-May
Doraji Bear Sanctuary	55.87	Sept.-jan
Ghataprabha Wildlife Sanctuary	20.78	Oct.-Dec
Gudavi Bird Sanctuary	0.73	Jun-Nov
Melukote Wildlife Sanctuary	45.82	Oct-Apr.
Mookambika Wildlife Sanctuary	247.00	Nov-Apr
Nugu Wildlife Sanctuary	30.32	Oct-Apr
Pushpagiri Wildlife Sanctuary	102.59	Jan.-Mar
Ranganathittu Bird Sanctuary	0.67	All seasons
Ranibennur Blackbuck Sanctuary	119.0	May-Jan
Sharavathi Wildlife Sanctuary	431.23	Nov-may
Shettihalla Wildlife Sanctuary	395.60	Nov-May
Someshwara Wildlife Sanctuary	88.40	Nov-May
Thalakaveri Wildlife Sanctuary	105.00	May-Jun Oct-Jan

## Tiger Reserves

Name of the Tiger Reserve	Area (Sq. kms)	Year of Establishment
Bandipur	874	1973
Bhadra	492	1998

## Biosphere Reserve

Name of the Reserve	Area (Sq. kms)	Year of Establishment
Nilgiri	5520	1986

## Recently discovered species

Many areas of Karnataka, especially in the forests of Malnad region are unexplored and new species of flora and fauna are discovered from time to time. Some of the new species of flora recently discovered in Karnataka include *Paracautleya bhatii* ( a ginger) and *Isachne veldampii* (a grass), both of which were discovered near Manipal in Udupi district. Two species of algae, *Cosmarium bourrellyi* and *Cosmarium desikacharyi* were discovered in a paddy field in Belgaum. Other new species of flora discovered in Karnataka include *Isoetes Udupiensis* (a flowering plant) and *Pisolithus indicus* (a fungus).

Some of the new species of fauna discovered include two species of ants, *Dilobocondyla bangalorica* which was discovered on the campus of Indian Institute of Science, Bangalore and *Discothyrea sringerensis* which was discovered near Sringeri. Three new species of frogs; *Philautus luteolus*, *Philautus tuberothumerus* and *Nyctibatrachus petraeus* have been discovered in Karnataka. Explorations in the Sharavathi river have yielded new fish species like *Batasio sharavatiensis* (a bagrid catfish), *Schistura nagodiensis* and *Schinstura Sharavathiensis*. Another fish species, *puntius coorgensis* has been discovered near *Bhagamandala* in the Kaveri river. Some other species of fauna discovered in Karnataka include two species of whiteflies *Distinctaleyrodes setosus* and *Aleurocanthus arecae* and a caecilian, *Gegeneophis madhavai*. Explorations in the soil around the Linganamakki reservoir have revealed eleven new species of earthworms.

## Endangered species



Frog “Indirana gundia”

Karnataka is the home of few critically endangered species of flora that include evergreen trees like *Dipterocarpus bourdilloni*, *Hopea erosa* and *Hopea jacobi* *Croton lawianus* (a small tree) and *Pinnatella limbata* (a type of moss). Some of the critically endangered species of fauna found in Karnataka include *Gyps indicus* (the Indian vulture) and two species of frogs, *Indirana gundia* (found only in Gundia range, Sakleshpur) and *Micrixalus Kottigeharensis* (found only near Kottigehara, Chikkamagaluru district).



Some of the endangered species of flora include evergreen trees like *Cynometra bourdillonii*, *Cynometra travancorica*, *Hopea glabra*, *Hopea parviflora*, *Hopea ponga*, *Hopea racophloea*, *Hopea wightinana*, *shored roxburghii* and *Tarenna agumbensis* and flowering plants like *Glochidion pauciflorum*, *Glochidion tomentosum*, *Ixora lawsoni* and *Syzgium stocksii*. Other endangered trees found in Karnataka include *Isonandra stocksii*, *Kingiodendron Pinnatum*, *Maesa velutina*, *Myristica magnifica*, *Rapanea striata* and *xylosma latifolium*.

Endangered species of fauna found in Karnataka include the tiger, Indian Elephant, Lion-tailed macaque, turtle and dhole, the Indian wild dog. Many endangered species of amphibians are found here including frogs, *Indirana brachytarsus*, *Microhyla sholigari*, *Minervarya sahyadris*, *Nyctibatrachus aliciae*, *Nyctibatrachus hussaini*, *Nyctibatrachus sanctipalustris*, *philautus charius*, *philautus wyaadensis*, *Ramanells mormorata* and *Rhyacophorus laterals* and a toad, *Bufo Beddomii*. Other endangered species of fauna include *Hipposideros hypophyllus* (the Kolar leaf-nosed bat) and *Pseudomulleria dalyi* (a molluse)

### 3. The Eastern Plains

The Deccan plateau forms the eastern plains of Karnataka. This forms 2/3 part of geographical area of Karnataka. This area receives low and scanty rainfall and the temperature is very high. Therefore, the vegetation is thorny scrub. The topography is generally rocky. The total forest area in this region accounts only 7% of the geographical area. The forests are scattered all over and in small pockets, open and stimulated but are known to possess great variety in terms of plant and animal species. The hardiness of various species to withstand the vagaries of nature in the form of extreme heat and drought conditions provides good habitat for unique biodiversity in this area.

The Northern Plateau is generally flat with an average altitude 300-600 meters above MSL. The southern part consists of higher plateau upto 700 meters MSL. The soil types ranging from laterites, red, red mixed yellow gray and black. The vegetation types of the region fall into southern tropical dry deciduous and southern tropical thorn forests. The species occur here are mostly *Acacias*, *Hardwickia*, *Neem*, *Pongamia*, *Somida*, *Santalum albam*, *Ficus* etc. The region has 1421 species of angiosperms belong to 696 genera under 140 families. Out of 140 families 38 families are represented by 1 genus and 1 species only, 11 families have 1 genus represented by 2 species. 5 families contain 1 genus and 3 species. 3 families have one genus represented by 4 taxa. A total of 59 families (45%) are represented by a solitary genus only. 107 species are listed as medicinal plants but due to scarce occurrence many cannot be harvested. There are some endemic species in the region such as *Brachystelma ciliatum*, *Brachystelma Kolarensis* from Kolar districts, *Brachystelma elenaduensis* from Tumkur district, *Schizachyrium sudhanshunii* from Raichur district.

### Fishes - Biodiversity

Fish is a rich source of proteins, polyunsaturated fatty acids, calcium, iodine and important vitamins A, D etc. Fish yield varieties of valuable by-products such as fish meal, oil, gelatin, insulin etc. Fish, being an important commercial commodity, is continuously



Betta splendens **Siamese Fighter Fish**

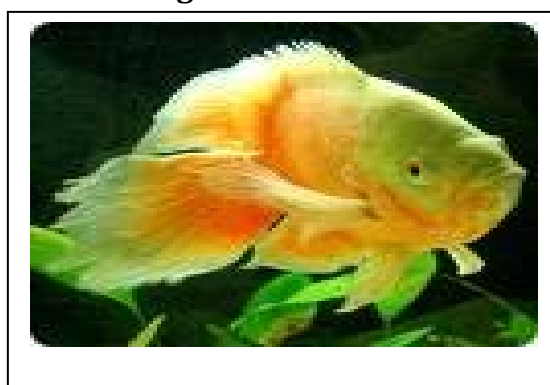
In India 2500 fish species have been recorded of which 930 are from fresh water habitats and 1570 from marine waters. The study reveals that fish fauna of Karnataka is represented by 300 freshwater and 405 marine species. These have been grouped under 23 Orders, - 106 families and 241 genera.

Fish as food has been harvested for several decades but during the past 3-4 decades the exploitations have been on an intensive scale resulting in diminished populations. Constantly few efforts have been made to replenish fish stock. Pollution of marine waters through oil spills, release of industrial wastes, radioactive residues, and untreated sewage entering from coastal cities have adversely affected fish growth and size of fish population. In fresh water habitats, the main causes for the decline of indigenous fish and fisheries resources are siltation, mining activities, land use activities etc. Added to this, water bodies are treated as dumping grounds for garbage, sewage, industrial effluents etc. As a result these are becoming increasingly polluted. Constructions of dams, weirs and barrages have resulted in stagnant water bodies which helps to the growth of obnoxious weeds. Harmful fishing practices like poisoning and dynamiting fish congregations in shallow water areas and pools have lead to the decrease/destruction of their populations.

Increased fishing activities in marine waters through trawling, purse-seining and fishing during the breeding seasons have adversely affected the fish populations. Trawling operations are mostly responsible for depletion of bottom dwelling fish species like perches and prawns. Purse-seining activities have brought down the catches of shoaling fishes like mackerel and sardines and are responsible for large scale capture of young and immature, gravid and brood fish as well. The most affected groups are clupeids, perches, polynemids, sole (flat) fishes and elasmobranches (sharks, rays and skates). Amongst clupeids, oil sardine and anchovies have shown wide fluctuations in the landings and a declining trend is evident. Members belonging to Order Perciforme, notably seer fishes, mackerels, sciaenids, lactarius (white fish), pomfrets and polynemids are caught in small numbers over the last two decades. The sole fishery has also declined considerably. Similarly, increased long line fishing round the year have brought down the population of sharks, rays and skates.

In inland waters, more thrust has been laid to increase fish production with the help of Indian and exotic major carps alone. The native species such as indigenous carps, clupeids and murrels well attuned to ecological conditions have been neglected. Among carps, *Tor* spp. *Labeo* spp. *Cirrhina* spp and *Puntis* spp are the threatened groups further *Silonia childreni*, *Mystus krishnensis* and *Bagarius yarrelli* have almost disappeared totally from their freshwater habitats. The most economically important clupeid *Hilsa ilisha* has disappeared totally from the Krishna and Cauvery riverine systems due to construction of dams and anicuts. Similarly abrupt decline in murrel fisheries is noticed for the past 2-3 decades. In majority of these instances the prime reason for reduction in fish population has been indiscriminate fishing, killing of the brood stock and young ones etc.

### **Long Finned Albino**



## FRESHWATER FISHES



The annual fish production in the state from the freshwater sector is about 1.2 lakh metric tones and the production of marine fishes has remained at 1.70 lakh metric tones level for many years. The Department of Fisheries in the state, in order to boost inland fish production to meet the growing demand, laid more stress on the culture of fast-growing Indian major carps like *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala*, as also exotic fish such as – *Cyprinus carpio*, *Hypophthalmichthys molitrix* and *Ctenopharyngodon idella*. These introduced fish species have adopted well in freshwater. Since few years, the introduced *Cyprinus carpio* (Common carp) and inadvertently entered *Oreochromis mossambica* (Tilapia) have dominated in the inland water fishery, as they breed and multiply fast in a short span of time. The introduction of all these fish species, has resulted in the decline of the population of indigenous fish species including *Labeo*, *Cirrhinus*, *Puntis*, Catfish, Murrels, etc.

## MARINE FISHES OF KARNATAKA

Karnataka state is endowed with vast marine and fresh water resources. The state has 300 km of coastline, 27,000 sq.km continental shelf and 87,000 sq. km of exclusive economic zone besides 8,000 ha of brackish water area. The marine fish production potential is estimated at around 4.25 lakh M.T. per annum. Prior to introduction of mechanized fishing crafts and gear, the marine fish landings were around 0.18 lakh M.T. per annum. With the introduction of mechanized trawlers for harvesting bottom dwelling fishes, and purse seines for pelagic fishes and gill netters for mid water species, the fish landing has recorded a high of 2.23 lakh M.T per annum.

In Karnataka, mackerels, sardines, anchovics and other elupeids form the dominant pelagic fishing while catfishes, Sciaenids, Perches, sharks and etc. constitute the deep sea fishing.

The experience has shown that the landings of some fish species have shown significantly declining trend and keeping these facts in mind, certain conservation measures are being enforced. Declaration of a closed season for fishing during monsoon (June to August) under Karnataka Marine Fisheries Regulation Act is a welcome measure. Similarly banning the operation of mechanized fishing vessels in a 10 km radius of foreshore has set apart a 3,000 sq. km area for traditional fishing and thus prevent over exploitation in foreshore water. The ban on exploiting brood fishes during spawning season (Monsoon) and prevent catching of juveniles using small meshed fishing nets are measures aimed to improve fish production in years to come.



**Tiger-barbes**

Decrease in fish production is mainly attributed to discharge of domestic and untreated industrial effluents, detergents, oil spillage, indiscriminate fishing by foreign fishing vessels in E Z area etc.

#### **THREATENED FISHES OF KARNATAKA**



**Bony fish**

Karnataka, five of them have been declared as fish sanctuaries by the Government under Karnataka Inland Fisheries (Conservation, Development & Regulation) Act 1996, one is located in the Forest Sanctuary (Muttatti area) which is under the supervision of Jungle Lodges and Resorts Organization. The remaining seven are in protected state to some extent as they are under the jurisdiction of religious organizations like temples and ashrams (mutts).

Though there are 14 locations identified for declaration as fish sanctuaries in



In these sanctuaries some of the threatened species are sheltered but not managed on scientific lines. These fish also face the threat of destruction due to habitat alteration, over exploitation, pollution, siltation, weed infestation, poisoning, dynamiting, introduction of prolific breeding exotic fish, as such, there is reduction in their numbers.

Sporadic efforts have been made to stock the sport fish “Mahseer” in certain stretches of rivers Cauvery and Sharavati. One of these is located in the forest sanctuary (Muttati Area). This stretch of river is leased to M/s.Jungle Lodges and Resorts, Government of Karnataka. Nisargadhama near Kushalnagar, Madikeri district is also a protected place and is under the supervision of Forest Department. As a step towards artificial propagation of “Mahseer”, a hatchery at Harangi is established.

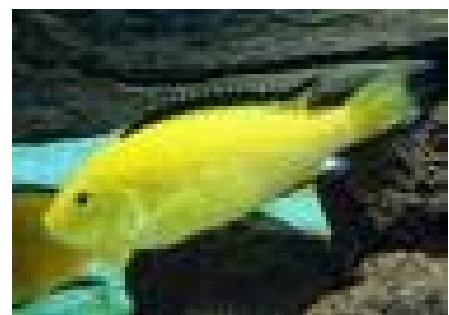
In recent years it is observed that marine waters are also getting polluted due to discharge of industrial/domestic effluents, oil spills, dumping of radio active waste, over exploitation, fishing during monsoon, operation of mechanized vessels in demarcated 10 km zone for traditional fishing. Clandestine fishing by foreign vessels in EEZ area has resulted in decline of marine fish landings consequently affecting certain fish species. Thus it is imperative that immediate steps be taken to rehabilitate the threatened fish species.

**The following fish species are reported to be on the verge of extinction -**

1. *Labeo fimbriatus* (Bloch)
2. *Labeo kontius* (Jerdon)
3. *Labeo porcellus* (Heckel)
4. *Labeo potail* (Sykes)
5. *Labeo calbasu* (Hamilton Buchanan)
6. *Labeo nigrescens* (Day)
7. *Gonoproktopterus curmuca* (Hamilton - Buchanan)
8. *Gonoproktopterus dubius* (Day)
9. *Gonoproktopterus micropogon* (Valenciennes)
10. *Gonoproktopterus thomassi* (Day)
11. *Puntius carnaticus* (Jerdon)
12. *Puntius dorsalis* (Jerdon)
13. *Puntis narayani* (Hora)
14. *Puntis puckelli* (Day)
15. *Neolissochilus hexagonolepis* (McClelland)
16. *Thynnichthys sandkhol* (Sykes)
17. *Mystus krishnensis* Ramakrishnaiah
18. *Mystus punctatus* (Jerdon)
19. *Neotropius khavalchor* kulkarni
20. *Bagarius yarrelli* (Sykes)



**Labeo fimbriatus**



**Labidochromis caeruleus**

## Medicinal Plants



**Saraca ashoka**

Forests of Karnataka harbours 1493 medicinal plants belonging to 808 genera and 108 families. They occur in different vegetation types across the Western Ghats. Medicinal plants are most valuable natural resources. Rapid urbanization and habitat loss is resulting in the loss of many important medicinal plants. Medicinal plants find application in pharmaceutical, cosmetic, agriculture, animal husbandry and food industries. Some of the medicinal plants are on the verge of extinction due to unsustainable harvest and lack of knowledge, some of the medicinal plants on the verge of extinction are *Rauvolfia serpentine*, *saraco asoca*, *Glorisa superba* etc.

**Medicinal Plants** are the main ingredients of local medicines and are of vital importance in traditional healthcare. People use medicinal plant species for sustenance of their traditional healthcare system both logistically as well as economically. But an inclination towards modern technology and over extraction of many of these plants have resulted in considerable depletion of the population of such species and some have become extinct.

In Karnataka according to a study of the Botanical Survey of India there are 3924 species belonging to 1323 genera and 199 families in the forests, of which 1493 species are of medicinal value. These belong to 808 genera and 108 families. They occur in different vegetation types across the Western Ghats. It is estimated that 90% of the industrial requirement of plant material is coming from the forests. In the direction of conservation the Species recovery programme by conserving the habitat of threatened medicinal plants and steps to enhance production seem to be the only solution to stop further degradation. The Karnataka Forest Department has initiated various programmes for the conservation of medicinal herbs, shrubs and trees associated with traditional methods of medicine. The traditional knowledge - based Indian ethnic medicine system can help in improving general wellness.



**Rauvolfia serpentina (Serpentwood)**



**Cinchona Succirubra (Cinchona)**

Atharvaveda is the oldest world literature on plant use against diseases. Many diseases are mentioned in Atharvaveda. To combat these diseases many plants were prescribed in the process of treatment. Charaka samhitha and Sushrutha samhitha are the two major post-Vedic codified literature in Ayurveda. In Ayurveda and other systems of medicine different parts of the same plant in different seasons and for different therapeutics are used.

These medicinal plants are most valuable natural resources. Rapid urbanization is resulting in the loss of many important medicinal plants. Scientific documentation of medicinal plants has proved a helpful resource for Ayurvedic healthcare system. Only a quarter of the world population knows the helpfulness of different Indian medicinal plants. With the help of modern scientific knowledge and research we can develop a healthcare system without side effects. The literature on medicinal plants is written in Sanskrit. This knowledge is used in synthesis of life saving drugs. According to World Health Organization almost 33% of the world population living in Asia and Africa is not able to buy essential drugs. This problem can be solved by replacing the high-priced drugs with traditional medicines which is effective, cheaper ones derived from naturally occurring resources.

### **Importance of Medicinal plants:**

Medicinal plants find application in pharmaceutical, cosmetic, agricultural and food industries. The use of medicinal herbs for curing diseases has been documented in the history of all civilizations. Man in the pre-historic era was probably not aware of the health hazards associated with irrational therapy. With the onset of research in medicine, it was concluded that plants contain active ingredients, which are responsible for the curative action of the herbs.

Before the onset of the synthetic era, man was completely dependent on medicinal herbs for the prevention and treatment of diseases. With the introduction of scientific procedures the researchers were able to understand the toxic ingredients present in the green flora. The scientists isolated active constituents of the medicinal herbs and after testing some were found to be therapeutically active. Aconitine, atisine, lobeline, nicotine, strychnine, digoxin, atropine, morphine are some common examples.

Recent research has substantiated the biological activities of some medicinal herbs. Cancer is one such segment where researchers are expecting new molecules from herbs that can provide us with tools for fighting this dreaded disease. Diabetes is another area where a lot of research is going on.

### **Medicinal plants Conservation**

Medicinal Plants are the main ingredients of local medicines and are of vital importance in traditional health care. People use medicinal plants species for sustenance of their traditional health care system both logistically as well economically. But due to more inclination towards modern Technology and over extraction of many of these plants has resulted in considerable depletion of the population of such species and some have become extinct.

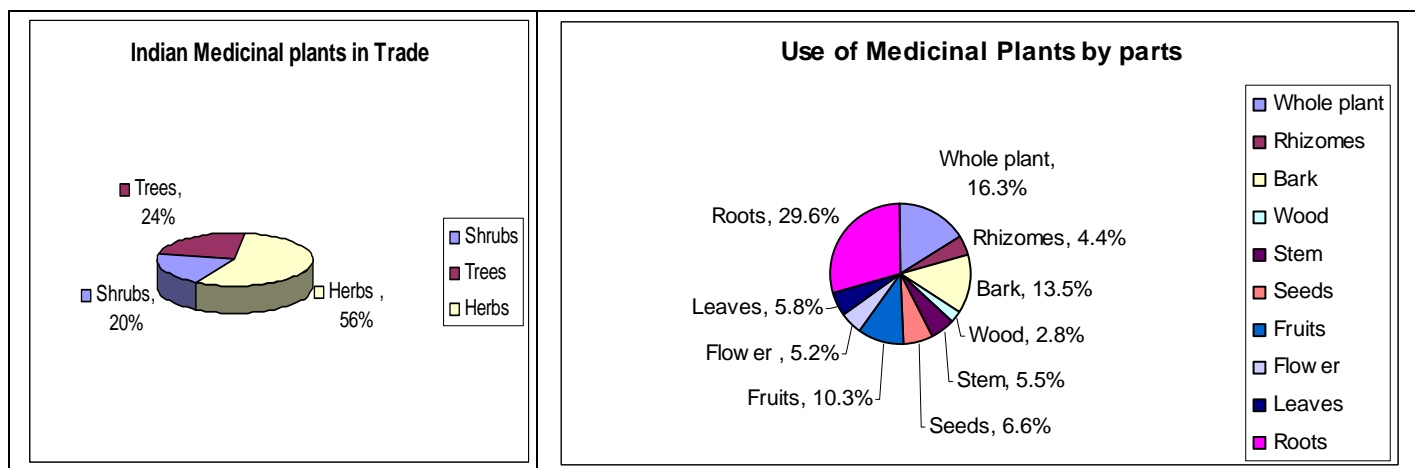
In Karnataka with the help of Foundation for Revitalization of Local Health Traditions (FRLHT) Bangalore, 13 Medicinal Plant Conservation Areas (MPCA) and Medicinal Plant Development Areas (MPDA) have been established and are being managed with the help of

local people. Details of Medicinal Plants Conservation Areas (MPCA) in Karnataka are given below:

Location of Medicinal Plant Conservation Areas (MPCA) in Karnataka			
Sl. No.	Name of the MPCA	Height about MSL (m)	Forest type sub-group
1.	BRT Hills	790-1050	Southern dry mixed deciduous forest
2.	Sandur	550-773	Southern dry mixed deciduous forest
3.	Savanadurga	800-970	Dry Deciduous scrub
4.	Karpakapalli	600-750	Dry Deciduous Scrub
5.	Talacauvery	1000-1355	West coast semi-evergreen forest
6.	Subramanya Temple	250-800	West coast semi-evergreen forest
7.	Charmadi	300-1250	West coast semi-evergreen forest
8.	Devimane	50-500	West coast semi-evergreen forest
9.	Kudremukh	760-820	Southern hill top tropical evergreen forest
10.	Kemmanagundi	1300-1700	Southern hill top tropical evergreen forest
11.	Devarayanadurga	850-1040	Southern thorn forests
12.	Agumbe	600-700	West coast tropical evergreen forest
13.	Kollur		West coast tropical evergreen forest.

Medicinal plants are important component of natural resources and are currently recognized throughout the world. An estimated 30,000 species fall into this group. Around 90% of the species are used by eco system people and 10% of the world-known medicinal plants are in national and global trade. Around 70% of worlds known plants occur in tropical forests. Remaining 30% occur in temperate, alpine and high altitude vegetation.

Major diversity of medicinal plant species exist in the forest, hence it is necessary to promote in situ conservation of these medicinal plants in natural resources. Further, it is also necessary that these plants are made available for people to meet their needs of medicinal plants. Hence, Insitu and exsitu conservation strategies are required.



The following are some of the strategies to be considered for the sustainable utilization of medicinal plant wealth:



- (a) Sustainable harvesting from the wild.
- (b) Collection of critically endangered species should be strictly banned from the trade for certain period
- c. Assessment of the threat status of different enlisted medicinal plants in order to prioritize the plants to be selected for immediate care. People's participatory program can be included for this type of study as the local people are the real information source for getting the clear idea of the present and past distribution of a particular species at a particular locality.
- d. Medicinal plant under high demand but under the threat category has to be given prime importance for future research studies.
- e. Wherever possible, integration should be practiced between food crops and medicinal plant cultivation.
- f. Adoption of a net working system involving public and private institutions so that there is complete linkage in Large-scale cultivation projects funded by industries on marginal lands with the available agro-techniques so as to stabilize the supply, regularize trade and quality of material.
- g. Research program for those species whose regeneration capacity with the available material is very poor and knowledge about their biology and life cycle is limited

### Important Bio-resources used by Bio-industries in Karnataka

Sl No	Trade Name/ Local Name/English Name	Botanical Name	Total Qty. in Kgs	Total No. of Companies
1	Satawari	Asparagus racemosa	51442.3	65
2	Ashwaganda	Withania Sominifera	48552.4	98
3	Amla	Embllica officinalis	42361.8	68
4	Alale/ Alalekaisippe	Terminalia Chebula	40855.1	64
5	Bevu / Neem	Azadiracha indica	31800.6	39
6	Amrutha balli	Tinospora cordifolia	21472.1	32
7	Hippali sanna	Piper Longum	19373.9	76
8	Tulsi	Occimum sanctum	19195.8	34
9	Adusoge	Adathoda Vasaka	18090.8	55
10	Tarekai sippe	Terminalia belarica	17915.3	43
11	Shunti / Ginger	Ginger Oil	17629.3	38
12	Drakshi	Vitis Vinifera	17533.1	41
13	Bala	Sida-Cardifolia	17350.32	30
14	Kumari	Aloe barbadensis	15808	29
15	Kachu / Khadira	Acacia Catechu	15776.8	43
16	Bhringamalakadi Taila	Eclipta alba	13078	37
17	Menasu	Piper nigrum	11406.2	56
18	Athimadhura	Glycyrrhiza glabra	11031.8	51
19	Ginger	Zingiber Officinale	10946.52	49

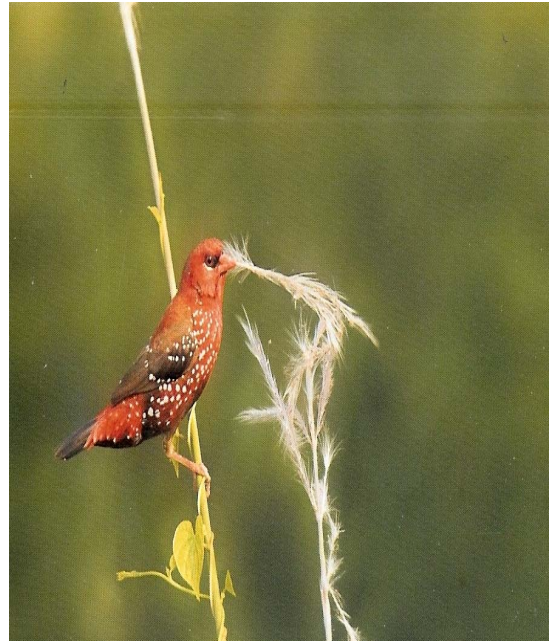
20	Guggulu	Cuminum cyminum / Commiphora wightii	10303.8	61
21	Brahmi	Bacopa monneri	10298.6	29
22	Neggilu	Tribulus Terrestris	9387.3	45
23	Ahoka	Saraca Indica	9096.1	45
24	Arishina	curcuma longa	8960.9	67
25	Kantakari	Solanum zanthocarpum	8625.5	46
26	Komme beru	Boerhavia diffusa	8225.1	48
27	Lodhrasava	Scyzizium Aromatic	6843.2	57
28	Brhati	Solanum indicum	6428.76	25
29	Konnari gadde	Cyprus rotundus	6232.2	37
30	Billvapathre	Aegle Marmelos	6182.8	38
31	Elakhi	Elattaria cardamomum	5869.5	47
32	Pushkaramoola	Inuala Racemosa	5766.8	30
33	Kotambari	Coriadrum sativum	5495.1	34
34	Jirige Bili	Cummininum cyminum	5291	40
35	Dalchini	Cinnamomum zeylancium	5124.6	50
36	Baje	Acorus calamus	4726.8	41
37	Lakkisoppu	Vitex negundo	4401.8	25
38	Ajamoda	Apium leptophyllum	4322.5	31
39	Arjuna	Terminalia Arjuna	4285.32	28
40	Devadaru	Cedrus deodara	3887	38
41	Jayi pathre	Myristica Fragrns	3568.5	44
42	Ananthamoola	Hemedesmus indicus	3456.96	28
43	Kudachal	Hoarrhena antidysenterica	3372.2	25
44	Jatamanasi	Nardostachys jatamansi	2971.8	39
45	Daruhaldi	Berberis Aristata	2296.32	35
46	Kutki	Picorothiza kurroa	1801.8	26
47	Shyonaka	Oroxylum indicum	1315.132	32

## Birds Biodiversity

Birds can live in different habitats depending upon the living conditions, different species live in different geographical zones such as sea birds like terns and gulls etc, and the spectacular white bellied sea eagle can be seen in coastal region.

Western ghats are the most important habitat for birds like Nilgiri Wood-pigeon (*Columba elphinstonii*), Bluewinged or Malabar parakeet (*Psittacula columboides*), Whitebellied treepie (*Dendrocitta leucogastra*), Gray headed Bulbul (*Pycnonotus priocephalus*), Rufous Babbler (*Turdoides subrufus*), Rufousvented/Wayanad laughing thrush (*Garrulax delesserti*), Whitebreasted/Grey-breasted laughing Thrush (*Garrulax jerdoni*), Black and orange/black and rufous flycatcher (*Muscicapa nigrorufa*), White-bellied Blue flycatcher (*Muscicapa pallipes*), Niligiri flycatcher (*Muscicapa albicaudata*), Broad-tailed Grasswarbler/grassbird (*Schoenicola*

*platyura*), Rufous-bellied/white bellied shorwing (*Brachypteryx major*), Nilgiri Pipit (*Anthus nilghiriensis*)



**Red Munia**



**Yellow Throated Bulbul**



**Spotted Dove**

The bird species varies considerably according to the different regions.

a) Coastal Karnataka: Offers good opportunities to sight sea birds like terns and gulls and many other water birds, particularly in winter. The beaches of Uttara Kannada district offer spectacular views of the Whitebellied Sea Eagle.

b) Western Ghats: The lifeline of a majority of south India's flora and fauna. An action zone for bird life and also importantly some of the largest and most beautiful butterflies of the Indian sub-continent. Good birding can be done around streams and waterholes. Forest species like Fairy blue bird, Malabar Trogon [and butterflies like southern birdwing, Paris peacock, Red Helen] can be sighted in the high altitude shola-grassland ecosystem of Kudremukh National Park (Chickmagalur / Udupi districts) and Baba Budaingiris (south & south-eastern portions of Bhadra WLS), Rainforests of Bisle (Sakleshpura taluk), Pushpagiri WLS, Brahmagiris (Brahmagiri WLS, South Kodagu dist.) and also some parts of Billigiri Ranganatha hills (B.R.T. WLS, Chamrajnagar dist.)

c) Deccan Plateau / Eastern Plains: Virtually all the districts of east Karnataka are in the rain shadow area. They have good scrub forests and also some very good grasslands. Important birding areas are the grasslands of Ranibennur (Haveri dist.), grasslands of Maidenahalli (Madhugiri taluk), dry deciduous forests of Sandur (Bellary), Devarayanadurga hills (near Tumkur), Savanadurga state forest (Magadi Taluk, Bangalore rural district), Cauvery WLS (Mandya dist.)

#### **Endemic birds:**

The maximum number of endemic birds in Karnataka are found along the Western Ghats. The following is the list of birds endemic to Western Ghats of Karnataka:

1. Nilgiri Wood-Pigeon (*Columba elphinstonii*)
2. Bluewinged or Malabar parakeet (*Psittacula columboides*)
3. Whitebellied treepie (*Dendrocitta leucogastra*)
4. Grey-headed Bulbul (*Pycnonotus priocephalus*)
5. Rufous Babbler (*Turdoides subrufus*)
6. Rufousvented / Wayanad laughing thrush (*Garrulax delesserti*)
7. Whitebreasted / Grey-breasted Laughing Thrush (*Garrulax jerdoni*)
8. Black and orange / Black and rufous flycatcher (*Muscicapa nigrorufa*)
9. White-bellied Blue flycatcher (*Muscicapa pallipes*)
10. Nilgiri flycatcher (*Muscicapa albicaudata*)
11. Broad-tailed Grasswarbler / Grassbird (*Schoenicola platyura*)
12. Rufous-bellied / White-bellied Shortwing (*Brachypteryx major*) Coppersmith
13. Nilgiri Pipit (*Anthus nilghiriensis*)
14. Small / Crimson-backed sunbird (*Nectarinia minima*)

Ø Yellow-throated bulbul is a rare bulbul patchily distributed in the rocky hills of southeastern Karnataka, B.R.T. sanctuary are good places to watch these birds.

Ø Grassland birds like Great Indian Bustard, Indian courser, sandgrouses and other ground birds can be sighted at Ranibennur (Haveri dist.) and Jayamangali Blackbuck Conservation Reserve near Maidenahalli village in Tumkur district.



## Orchids



**A typical orchid in Western Ghats**

Orchids are highly evolved and specialized group of plants. They are special types of plants, very sensitive found in Western Ghats as epiphytes on tree trunks also as terrestrial or marshy soils. Karnataka has 176 species of orchids from 49 genera; most of them are endangered and are brought under wildlife protection act.

Some of the orchids found in Western ghats are *Aerides erispa*, *calautne sylvatica*, *Derdrbium aquem*, *eria albiflora*, *oberonia bieormis* etc.

Orchid species survive in a narrow range of ecological and micro-site conditions. Orchids number over 17,000 wild species worldwide. In India, some 924 species are listed of which 287 species (31%) are endemic. In the Western Ghats 46% of the species are endemic.

Orchids are a unique group of flowering plants occurring in abundance in humid tropics and also in temperate areas. In India about 1200 species occurs of which the Western Ghats has 275 species and Karnataka in particular has 175 species.

Orchids are either epiphytes or terrestrial. Among the terrestrial a few are sapophytes growing on decaying materials found in the soil. Such ground orchids have tubers with well developed roots, which are infested with *mycorrhiza*, a benevolent partner to absorb nutrition from the soil. As a contrast, epiphytic orchids are tree dwellers without any organic connection with their hosts. They develop aerial roots which have a capacity to absorb moisture from the atmosphere and swollen fleshy stems at the bottom which constitute pseudobulbs. Orchids have herb like growth rarely shrub like growth forms with simple leaves in pairs or in clusters. A few orchids have variegated colors or patterns, externally.



**Vanda roxburghii**

The most unique features of flowers are their shape, size and odour. They are symmetrical or asymmetrical in floral parts unlike the other flowers of plant kingdom. They exhibit an infinite variations in having dissimilar sepals and petals, with a varied lips, and a columns with fused style, stigma and stamen (*Gynospemium*). Another distinct features of the flowers are spurs and pollen grains aggregated together to form a pollinium with sticky base.

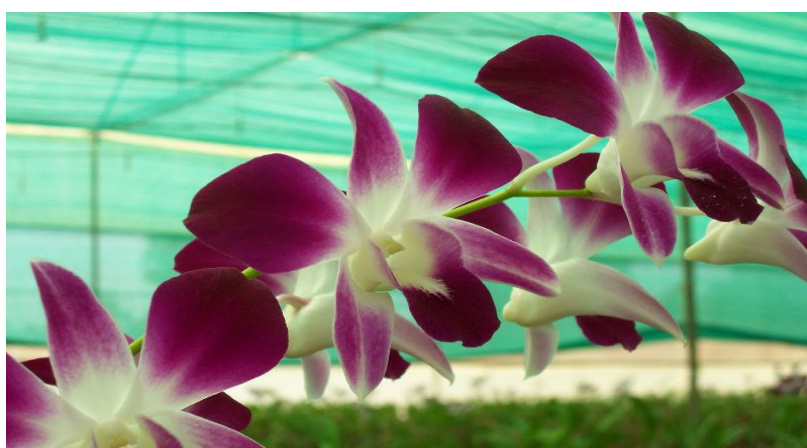
Flowers show a mimicry which is an indication of a deceitful pollination mechanisms in the form of insects, spiders and animals. Another distinct feature in orchid flower is resupination, a phenomenon of twisting 180 to bring the lip into a position favorable for insect to land safely and bring about pollination.

Commercially a few orchids and their hybrids in cut flower trade are important in flower industry. Among the Indian orchids *Dendrobium*, *Vanda*, *Cymbidium* have been much used in producing hybrids.

Orchids grow in nature by means of tiny seeds or by developing additional fresh seedlings (*kekii*). Commercially, they are grown in test tubes in special base in ascptic conditions or by means of detached growing portion of leaves for large scale commercial production.

The high endemism in orchids is perhaps because of certain physiological adaptive syndrome of the family bringing greater constraints on their existences, spread and replenishment in any particular area, viz.,

- Their existences in specific niches within the fragile ecosystem.
- Insect pollination in most of the species, particularly needing specific vectors to visit different speciefies.
- Inability to achieve fertilization in maximum number of ovules for viable seeds due to the fact that each ovary of the orchid possesses millions of ovules.
- Presence of an unorganized embryo in the seed, also without any food storage and hence needing infection of a specific strain/race of mycorrhiza as a food supplier before germination.
- Absence of corridors for orchid seedlings/propagules to pass similar niches for establishment and dispersal.



**Orchid - Sonia**

As the south-west monsoon clouds the entire area with its insistent rain, most of the hilly slopes once dry is soon draped in the graceful velvet of green grassy blanks with dappled sprouting of terrestrial orchids such as the *Habenaria grandifloriformis*, *H.longicorniculatat*,

*H.heyneana* etc. among the epiphytic orchids magnificent blooms of *Aerides sp.*, *rhynchostlis retusa*, hangs out in the drizzling rain from their arboreal abodes of tree branches.

Many smaller orchids such as *Eria dalzellii* bloom late in the rainy season from trees and bigger shrubs such as *Phyllanthus emblica*, *Careya arborea*, *Randia dumetorum* etc. As the rain calms down and the cold wind starts prevailing through valleys and hills, orchids such as *Dendrobium barbatulum*, *Oberonia brunoniana*, *Bulbophyllum neilgherrense* etc., blooms from their perched corners of the trees in their myriads of colors. Many small creatures including the scorpions safely make their homes in these highly colonized orchids. With the winter coming to a close and the valleys becoming more hotter, it is summer time and epiphytes like *Acampe praemorsa*, *Dendrobium lawnianum*, *D. macrostachyum*, *D.crepidatum*, *Cymbidium aloifolium* etc., starts flowering, becoming a cynosure to the eyes of the onlooker.

### **The “Hotspots” of orchids in Western Ghats of Karnataka are:**

1. Tadianamol in Kodagu (61 species, 6 endemic)
2. Bababudan in Chickmagalore (41 species, 18 endemic)
3. Dandeli in Uttara Kannada district (37 species, 23 endemic)

# Butterflies

Butterflies are biological indicators of the habitats. They are very sensitive to their environment, their very presence or absence indicates the health of the environment. There are over 300 species of Butterflies in Karnataka, Some of them are endangered such as Crimson rose, Danaid Eggfly etc.



Plain Tiger



Brown Demon



Grass Yellow



Blue Wonderer

Malbar Banded Swallowtail



The forests provide the ideal habitat for a wide variety of rare and endemic butterfly and moth species. These evergreen forests with tall canopy trees provide filtered sunlight that is beneficial to butterflies. Different species of butterflies and moths require different host species of plants for laying eggs and carrying out their respective life cycle. Coffee forests accommodate a wide variety of herbs and shrubs which act as ideal hosts for the caterpillars to feed on. Other wild species of grasses and plants which form the undergrowth act as larval host plants. The valleys with small waterfalls and rivulets provide diverse micro- habitats for the proliferation of butterflies





**Common Leopard**



**Common Sailor**

Butterflies are depicted as symbols in art since the times immemorial. They are among the most fascinating and beautiful insects. Butterflies undoubtedly are the most attractive among all insects. Vivid colours, shapes, sizes and patterns have fascinated man from Bronze Age. Most butterflies are diurnal and hence, easy to observe. Butterflies are the subject for the study for both biologists and the layman. Butterflies are primary consumers and so are important in any ecosystem. The life cycle of butterflies are closely related to plants. Relationship between any species of plants and butterfly is very specific. Plants and butterflies have co-evolved together. Butterflies are sensitive to environmental changes and are indicators.

The order Lepidoptera is the second largest diverse group of insects. So far, 1,40,000 species have been described. Of them 17,200 species are butterflies (Rhaopalocera). Lepidopterans have scales all over the body. Butterflies fly during the day, moths during night. Butterflies at rest hold the wings vertically over the back. Moths, in contrast may either hold the wings tent like over the back or wrap them around the body or extend them to the sides. Virtually all butterflies have knob like clubs at the tip of the antennae. Moths lack antennal clubs. The caterpillar has three pairs of walking legs and five pairs of prolegs.



**Common Castor**



**Yellow Pansy**



**Common Jezbal**

Western Ghats and Himalayas hold maximum species of butterflies and these are hotspots. The largest Indian butterfly is the common bird wing (19 cm at wing span) and smallest is the grass jewel (1.5 cm at wing span). *Colias hyale* Cramer and *Appias hippo* are endangered butterfly species.

## Butterflies in coastal Karnataka.

Sl.No.	Butterfly	Species
<b>FAMILY PAPILIONIDAE</b>		
1	Southern birdwing	<i>Troides minos</i> Cramer
2	Common jay	<i>Graphium doson</i> Feeder
3	Tailed jay	<i>Graphium gamemnon</i> Linn.
4	Lime butterfly	<i>Papilio demoleus</i> Linn.
5	Common mormon	<i>Papilio polymnestor</i> Linn.
6	Common mormon	<i>Papilio polytes romulus</i>
7	Common mormon	<i>Papilio polytes stichius</i>
8	Common rose	<i>Pachiliopta aristolochiae</i> Fab
9	Common mime	<i>Papilio clytia</i> L
10	Red helen	<i>Papilio helenus</i> L
11	Blue marmon	<i>Papilio polymenester</i> Cramer
12	Crimson rose	<i>Pachiliopta hector</i> L
13	Spotted swordtail	<i>Pathysa nomius nomius</i> Es
14	Common Bluebottle	<i>Graphium sarpedon</i>
15	Paris peacock	<i>Papilio paris</i>
16	Malabar banded peacock	<i>Papilio Buddha</i>
17	Common banded peacock	<i>Papilio crino</i>
18	Malabar rose	<i>Papilio pandiyana</i>
<b>FAMILY PIERIDAE</b>		
19	Common emigrant	<i>Catopsilia Domona</i> Cramer
20	Common jezebel	<i>Delias eucharis</i> Drury
21	Common wanderer	<i>Pareronia valeria</i> Fabricius
22	Common grass yellow	<i>Eurema hecabe</i> Moore
23	Small grass yellow	<i>Eurema lecabe</i> Linn.
24	Mottled emigrant	<i>Catopsilia pyraithe</i> Linn.
25	Great orange tip	<i>Hebomoia glaucippe</i> L
26	Pioneer	<i>Anaphaeis aurota</i> Fab.
27	Common gull	<i>Cepora</i> sps.
28	Albatross	<i>Appias albina</i>
29	White orange tip	<i>Ixias</i> sp.
30	Plain orange tip	<i>Colotis eucharis</i>
31	Psyche	<i>Leptosia nina</i>
<b>FAMILY NYMPHALIDAE</b>		
32	Common leopard	<i>Phalanta phalantha</i> Drury
33	Common sailor	<i>Neptis hylas</i> Moore
34	Yellow pansy	<i>Junonia hierta</i> Fabricius
35	Common castor	<i>Ariadne merione</i> Cramer
36	Plain tiger	<i>Danaus chrysippus</i> Linn.
37	Common tiger	<i>Danus genutia</i> Cramer
38	Common Indian crow	<i>Euploea core</i> Cramer
39	Danaid egg fly	<i>Hypolimnas misippus</i> L
40	Great egg fly	<i>Hypolimnas bolina jacintha</i>
41	Rustic	<i>Cupha erimanthus</i> D
42	Common baron	<i>Euthalia aconthea</i> C
43	Baronet	<i>Euthalia nais</i> F
44	Grey count	<i>Tanaceia lepida</i> B
45	Chocolate pansy	<i>Precis iphita</i> C
46	Peacock pansy	<i>Junonia hierta</i> F
47	Lemon pansy	<i>Junonia lemonias</i> L

48	Clipper	<i>Parthenos Sylvia L</i>
49	Angled castor	<i>Ariadne ariadne</i>
50	Baron	<i>Euthalia garuda</i>
51	Blue admiral	<i>Nanesia canace</i>
52	Blue pansy	<i>Précis orithya</i>
53	Black rajah	<i>Charaxex fabius</i>
54	Commander	<i>Linenitis procris</i>
55	Common nawab	<i>Eriboea athomas</i>
56	Common sergent	<i>Pantoporia perius</i>
57	Joker	<i>Byblia ilithyia</i>
58	Lacewing	<i>Cethosia nietneri</i>
59	Yeomen	<i>Cirrochroa thais</i>
60	Grey pansy	<i>Précis atlites</i>
61	Red admiral	<i>Vanessa indica</i>
	<b>FAMILY SATYRINAE</b>	
62	Common evening brown	<i>Melanitis leda leda D.</i>
63	Common brush brown	<i>Mycalesis perseus F</i>
64	Common four ring	<i>Ypthima hubneri K</i>
65	Common five ring	<i>Ypthima balbus Fab</i>
	<b>FAMILY LYCAENIDAE</b>	
66	Lesser grass blue	<i>Zizina otis Fab.</i>
67	Common pierrot	<i>Castalius rosimen Fab.</i>
68	Common silver line	<i>Spindaris vulcanus Fab.</i>
69	Tiny grass blue	<i>Zizula hylax F</i>
70	Gram blue	<i>Euchrysops cnejus F</i>
71	Pale grass blue	<i>Pseudozizeeria maha K</i>
72	Rounded pierrot	<i>Tarucus nara K</i>
73	Zebras blue	<i>Leptotes plinius</i>
74	Hedge blue	<i>Actolepis puspa</i>
75	Line blue	<i>Chilades laius</i>
76	Pea blue	<i>Lampides boeticus</i>
77	Red pierrot	<i>Talicauda nyseus</i>
78	Peacock royal	<i>Tajuria cippus</i>
	<b>FAMILY DANIINAE</b>	
79	Striped tiger	<i>Danus genutia C</i>
80	Dark blue tiger	<i>Danus Melissa C</i>
81	Common Indian crow	<i>Euploea core C</i>
	<b>FAMILY ACRAEIIDAE</b>	
82	Tawny coster	<i>Acraea violae F</i>
	<b>FAMILY HESPERIIDAE</b>	
83	Indian skipper	<i>Spiallia galba Fabricius</i>
84	Grass demon	<i>Udaspes folus Cramer</i>
85	White banded owl	<i>Hasora taminatus H</i>
86	Common banded owl	<i>Hasora badra M</i>
87	Common spotted flat	<i>Celaenorrhinus leucocera K</i>
88	Rice swift	<i>Borbo cinnara W</i>
89	Indian palm bob	<i>Suastus greminus</i>
90	Giant red eye	<i>Gangara thyris</i>
91	Tamil grass dart	<i>Taractrocera ceramus</i>
92	Dark palm dart	<i>Telicota ancilla</i>
93	Snow flat	<i>Teagiades litigiosa</i>
94	Pied flat	<i>Pseudocoladinia dan</i>

## Current status of Biodiversity

One of the fascinations of life is its incredible variety. The Indian tradition estimates this variety at 84 lakh. Modern science estimates that there are somewhere between 80 to 120 lakh different species of living organisms on the earth. But the bulk of this diversity of life is in the form of fungi and smaller animals that are yet to be described by scientists. Only about 16 lakh species are known to science, and India with a land area of 2.2% of the earth as a whole harbours over 1.2 lakh or more than 7.5% of the world's known species. This is why India ranks amongst the world's top twelve mega diversity countries.

The state of Karnataka is a part of the highly biodiversity rich regions of India. The state boasts of a great diversity of climate, topography, soils. It spans the sea coast with its corals and mangrove swamps at the mouths of estuaries. It harbours verdant rain forests, paddy fields and coconut and areca nut orchards on the narrow coast flanked by the hills of Western Ghats. It bears deciduous woods and scrub jungles, and the sugarcane, cotton, groundnut, ragi and jowar fields of the Deccan plateau. The different environmental regimes support their own characteristic set of plants and animals.



**Lion tailed macaque**

The number of species in other groups are better known, and our state probably boasts of around 4500 species of flowering plants, around 522 species of birds, about 158 species of mammals, about 158 species of reptiles (turtles, snakes, lizards and crocodiles), about 70 species of frogs, and about 623 species of fish. Medicinal plants are one of the most important of these. About 300 species of such plants are in commercial use in Karnataka today. The industry knows that broad regions from which the supplies have been coming have been shifting, the levels of availability have often been changing and that in response the prices have also been changing; but has no really detailed information at its disposal. The only reliable information on these issues, albeit limited to their own localities, resides with forest produce. The lion tailed macaque and the racket-tailed drongo are characteristic of the rain forests, the blackbuck and the Great Indian Bustard of the grasslands and scrub jungles of the Deccan plateau. Roughly 25% of the 17,500 species of flowering plants of India occur in Karnataka; but over 40% of the 1228 species of the more mobile birds do so. The fraction of smaller animals present is likely to be closer to that for plants, since they too are not very mobile. So Karnataka probably harbours some 22,000 known and 100,000 total species of little known organisms.

There is no organized information on the status of the indigenous fish fauna of our freshwaters. Again the only source of information on this issue, albeit limited to their own localities, is with our native fisher-folk. Nor do we possess any detailed information on the genetic diversity of cultivated plants and domesticated animals which is still being maintained under field conditions by farmers and herders. We are, therefore, constrained to make only qualitative statements about this important sector. Ours is still a biomass-based civilization; many people cultivate a wide range of species and varieties, consume wild fruit



and fish, use fuel-wood to cook their meals and grass to thatch their huts and cowsheds, extensively employ herbal remedies and worship peepal trees and hanuman langurs.

We are also a state rich in knowledge of uses of our living resources, ranging from the classical traditions of Ayurveda, Siddha and Yunani, to folk medicinal practices and uses of vegetable perfumes, cosmetics and dyes. But Karnataka's ecological resource base is under threat, with extensive destruction of natural habitats, widespread degradation of agro-ecosystems and a growing burden of pollution. Simultaneously, the knowledge base of uses of biodiversity is also being eroded, with the younger generation becoming increasingly alienated from the natural world.

The wealth of strains of domesticated plants and animals on our farms and in the camps of our cowherds and shepherds also holds much promise. The hill chain of Western Ghats has a greater diversity of wild relatives of cultivated plants than any other region of comparable size in the world. Much of this diversity of domesticated organisms and their wild relatives is also being rapidly lost. Life in Karnataka's rivers, lakes, estuaries and the seas is under even greater stress than that on the land. With all attention focused on culturing of a few species of economic interest like carps and tiger prawns, there has been little thought devoted to conservation and prudent use of the state's aquatic biodiversity. Yet this loss is occurring at a time when pharmaceutical companies are focusing their attention on marine organisms as the greatest, and as yet little explored treasury of bioactive compounds on the earth. It is clear that we need to look after the ecological well being of Karnataka's lands and waters, not only of the few remaining natural habitats, but also of farm lands and irrigation tanks, of overgrazed pastures and eroded hill slopes. We need to carefully plan on conserving, sustainably using and restoring the biological diversity across the length and breadth of the state. We also need to conserve and benefit from the knowledge of uses and the traditions of conservation of this biological diversity.

### **Key Environmental Problems**

Biodiversity is being eroded in all the major ecosystems of the Karnataka state, in coastal and marine tracts, in streams, rivers, lakes and reservoirs, in protected areas, as also in humid and dry forests outside protected areas, in agro-ecosystems, and in urban ecosystems. This erosion may be traced to four significant environmental problems, namely, (a) non-sustainable harvests of living resources, (b) Habitat destruction and fragmentation, (c) Impacts of pollutants, and (d) Competition with colonizing, often exotic, invasive species.



**Tiger**

### **Non-sustainable harvests of living resources**

Non-sustainable harvests have been a significant cause of depletion of biodiversity. Poaching has affected a variety of organisms, such as Turtles breeding along sea beaches including the Olive Ridley, or otters breeding along riverbanks. There have been endemic people-wild life conflicts, especially in relation to elephants raiding crops and killing people. This has been accompanied by extensive poaching of male elephants and many other wild mammals.

Non-sustainable use by pharmaceutical and allied industry has led to substantial depletion of medicinal plant and other non-timber forest resources, *Rouwolfia serpentina* and *Gloriosa superba* being two well-known examples. Wild honey-bee populations have been decimated, because of the loss of nesting trees and sources of pollen and nectar, and use of pesticides in orchards and plantations. This has affected the agricultural productivity.



## Habitat destruction and fragmentation

Habitat destruction and fragmentation has plagued all of the state's ecosystems. Large tracts of forests have also been converted to monoculture plantations of teak, *Eucalyptus*, *Casuarina equisetifolia* and *Acacia auriculiformis*. These processes have led to the loss of many special habitats such as *Myristica* swamps and high altitude grasslands. In the dry zone, they have adversely affected several species dependent on large tracts of scrub such as the wolf and the Great Indian Bustard. The simultaneous extension of agriculture has led to a loss of grassland and scrub savanna habitats and erosion of species such as partridges and quails dependent on them. The processes of commercialization of agriculture have prompted the liquidation of sacred groves and traditionally protected species such as banyan, peepal and other *Ficus* species, peafowl and monkeys that were a characteristic feature of the traditional agricultural landscape. Open areas in urban ecosystems are also shrinking. So are the old irrigation tanks that constitute urban wetlands. Many have been drained, others are highly polluted and eutrophicated, resulting in a loss of their biota, including indigenous fish communities and migratory waterfowl.

## Impacts of pollutants

The manifold pollution problems impacting Karnataka's biodiversity include industrial effluents that contain heavy metals like mercury, untreated sewage from towns and cities, and bio-medical wastes from hospitals. Agricultural intensification has also meant high levels of use of pesticides, bioaccumulation of the pesticides and consequent erosion of biodiversity. The cotton growing tracts of Gulbarga and Raichur districts, and river command areas of Kabini, Kaveri and Ghataprabha have witnessed sharp reduction in populations of bird species, including beneficial insectivorous birds like drongos, as well as honeybees. Even the house sparrows are gone from Bangalore. Given the high levels of air pollution, only a few species of lichens persist on the tree trunks in urban areas.

## Exotic invasive species



Invasive Alien Species (IAS) are species whose introductions and spread outside their natural distribution affects the ecosystem. They are generally of short life span, have high reproduction capacity, produce large quantity of seeds/eggs and survive in hostile environment. They are easily adaptable and have no natural enemies in the new habitat. Invasive Alien Species are one of the greatest threats to biodiversity.

They have invaded every ecosystem type on earth which causes economic as well as environmental harm and adversely affect human health. Example: Lantana, Eupatorium, Parthenium, Coffee stem borer, Carnivorous Cat fish, Gambusia etc.



**Parthenium weed**

Exotic species have impacted the biodiversity of various fresh-water and terrestrial ecosystems of Karnataka. Spread of exotic fishes like *Tilapia* and, more recently, the African Catfish has contributed to an erosion of indigenous fish biota. The weedy water hyacinth is choking many of the wetlands. Large tracts of forests have been invaded by the weedy *Eupatorium*, they have also been converted to monoculture plantations of exotic species such as *Acacia auriculiformis*, *A. mangium*, *Eucalyptus species* and *Casuarina equisetifolia*. The Ranebennur Sanctuary, primarily meant to conserve blackbuck and the Great Indian Bustard has suffered in this fashion from the plantation of *Eucalyptus* trees. *Parthenium* has come to cover many scrublands and grasslands.

Globalization has resulted in greater trade, transport, travel and tourism, all of which have facilitated the introduction and spread of species that are not native to an area, reproduce and spread if the new habitat is similar to its native habitat.

The damage is further aggravated by climate change, pollution, fragmentation and loss of habitat. The convention on Biological diversity and its members (191 parties) recognize that there is an urgent need to address the adverse impacts of Invasive Alien Species, the convention expects that each contracting party shall, as far as possible and as appropriate, prevent the introduction, control and eradicate those alien species which threaten ecosystems, habitat and other species.”





## **Steps taken to conserve Biodiversity**

After CBD the Government of India had enacted Biodiversity Act 2002 subsequently Karnataka State has framed Biodiversity Rule 2005 and established the State Biodiversity Board. The above are instrumental in protection of Biodiversity. The main objectives of the Act and Rules are:

1. Conservation of Biodiversity,
2. Sustainable utilization of Biodiversity
3. Equitable sharing of benefits arising out of the commercial use of Biodiversity.

The efforts are going on in this direction at various levels. Further the goals have been fixed and the same has to be achieved by 2010 by various departments involved in resource management and Biodiversity management.

### **Biodiversity Goals 2010**

1. **Promote the conservation of biological diversity of ecosystems, habitats and biomes**
2. **Promote conservation of species diversity**
3. **Promote the conservation of genetic diversity**
4. **Promote sustainable use and consumption**
5. **Pressures from habitat loss, degradation reduced**
6. **Control threats from invasive alien species**
7. **Address challenges to biodiversity from climate change**
8. **Maintain capacity of ecosystems to deliver goods and services and support livelihoods.**
9. **Protect traditional knowledge, innovations and practices.**
10. **Ensure fair and equitable sharing of benefits arising out of the use of genetic resources.**
11. **Parties should have improved financial, human, scientific, technical and technological capacity to implement the convention.**

## HORTICULTURE BIODIVERSITY

As per survey report the total horticultural production in Karnataka State is 97.30 lakh tons per year. The production figures stand at 40.79 lakh tons (41.92%) with respect to Fruit Crops; 44.03 lakh tons (45.25%) Vegetable crops; 5.96 lakh tons (6.13%) Spice Crops; 4.96 lakh tons (5.09%) Garden/Plantation Crops and 1.57 lakh tons (1.61%) crops coming under Commercial Flowers including the Medicinal and Aromatic Plants.

Due to the introduction of the high yielding varieties and improved technology the productivity of horticultural crops has improved. Efforts are being made to boost-up the agricultural exports, mainly of horticultural produce like fruits, vegetables and flowers, through the effective Agricultural Policy.

According to the latest available information pertaining to various States Karnataka State has occupied Fifth place regarding Fruit Crops. But with regard to Commercial flowers our state has stood first with respect to area of 0.19 lakh hectares and second with respect to production being 1.57 lakh tons.



**Bougainville**

### REGISTERED GI CROPS OF KARNATAKA

The concept of geographical indication is fast developing globally. GIs is very essential and imperative in the current global scenario to seek legal protection in WTO countries.

#### Advantages of Geographical Indication Registration

- It provides better legal protection to facilitate an action in case of infringement so that the registered proprietor and authorized users can initiate infringement actions.
- The authorized users can exercise the exclusive right to use the geographical indication.
- Development of brands, ownership to the community.

**Following are the example of GI in horticulture:**



#### Coorg Orange

##### Coorg Orange (*Citrus reticulata*)

- ✓ Grown in and around Coorg district (around 240 kms from Bangalore), Karnataka.
- ✓ Historically Coorg Orange was introduced by the Britishers between 1830 and 1840.
- ✓ Excellent blend of acid and sugar in juice.
- ✓ It has tight skin compared to Nagpur Orange.
- ✓ Ripe fruits are greenish-yellow/orange in color.
- ✓ Maintains its unique taste and aroma with good keeping quality when it is grown

under high rainfall areas, hilly terrains (around 3000ft from MSL) and deep well-

drained soils.

### **Mysore Betel Leaf (*Piper betel*)**

- ✓ Popularity called as Mysore Chigurele (tender leaf)
- ✓ Historically grown in the back yard of Mysore Palace and the surrounding areas of Mysore city
- ✓ Specific hot taste (pungent) and smooth texture
- ✓ Requires tropical climate with high atmospheric humidity
- ✓ Suitable for cultivation in both uplands and wetlands



**Mysore Betel Leaf**

### **Nanjangud Banana (*Musa paradisiaca*)**

- ✓ Grown in Devarasanahalli and surrounding villages of Nanjangud Taluk (around 160 kms from Bangalore) in Mysore district, Karnataka
- ✓ Historically Nanjangud Banana fruits were being offered to Lord Sree Srikanteshwara at Nanjangud Temple
- ✓ Black clay, alluvial and saline soils are responsible for its unique characters.
- ✓ Fruits are golden-yellow, delicious in taste with unique aroma, taste and long shelf life
- ✓ Occurrence of hard lumps and loss of unique aroma when it is grown outside Mysore bio climate
- ✓ Maintains its high quality only under organic method of cultivation

### **Mysore Mallige (*Jasminum trifolium*)**



- ✓ This variety is predominantly grown in and around Mysore (around 140 kms from Bangalore), Karnataka
- ✓ Mythologically, Mysore Mallige was referred in great epics, Mahabharata
- ✓ Mainly used in garlands and other decorative purposes
- ✓ High fragrance is the unique feature of this flower
- ✓ Fragrance in this variety is influenced by agro-climatic conditions of Mysore and its surrounding areas
- ✓ Buds have good keeping quality with shelf-life of 2-3 days
- ✓ The dry and warm weather of the region is also responsible for the unique fragrance of this variety

### **Udupi Mallige (*Jasminum sambac*)**

- ✓ Predominantly grown in Shankarapura and surrounding villages (around 400 kms from Bangalore) in Udupi district, Karnataka
- ✓ Historically Udupi Mallige flowers were offered to Asta (8) Matts including the world famous Lord Krishna Temple since 12<sup>th</sup> century
- ✓ Flowers are highly fragrant and used for making garlands
- ✓ Buds have good keeping quality with shelf-life of 3-4 days
- ✓ Fragrance is influenced by lateritic soils, heavy S-W monsoon rains, warm and humid conditions

### **Hadagali Mallige (*Jasminum azoricum*)**

- ✓ Predominantly grown in Hadagali Taluk (around 300 kms from Bangalore) in Bellary district, Karnataka
- ✓ Historically the flowers of Hadagali Mallige were being sent daily to Hampi Sree Veerupaksha temple.
- ✓ Used mainly for garland making
- ✓ Strong fragrance is its distinct trait, hence used in cosmetic industry also
- ✓ The unique characteristic of this variety is influenced by dry sandy soils and dry climate of the region.

## **CROPS UNDER PIPELINE FOR GI REGISTRATION**

### **Kamalapur Red Banana (*Musa sp.*)**

- ✓ Unique to Kamalapur and surrounding areas of Gulbarga district (around 650 kms from Bangalore), Karnataka
- ✓ Grows 15 to 18 feet in height with a strong and thick trunk
- ✓ It is an 18-month crop
- ✓ Colour of the raw fruit is greenish-purple and turns to red on maturity
- ✓ Fruits have sweet taste and unique flavour
- ✓ A normal bunch has 5 to 7 hands and 40-60 fruits
- ✓ Fruits are slightly thickened towards base and tapered towards the apex. Apex is usually blunt

### **Byadagi Chilli (*Capsicum annum*)**

- ✓ Grown in Byadagi taluk of Haveri district (around 335 kms from Bangalore), Karnataka
- ✓ Express its unique characters when it is grown in S-W monsoon season, under rain fed conditions
- ✓ Grows best in well drained, sandy loam, red or black soils
- ✓ Fruits are long (upto 15-20 cms), slender, wrinkled and have attractive deep red colour
- ✓ Less pungent, contains less capsaicin
- ✓ Unique features of this variety is its wrinkled pericarp, which makes seeds adhere to it even if the fruit is broken
- ✓ Highly preferred for oleoresin extraction
- ✓ Lends attractive red color to dishes



### **Sagar Appe Midi Mango (*Mangifera indica*)**

- ✓ A special category of mango characterized by bunch bearing, small size and strong aroma
- ✓ It is grown in Sagar Taluk of Shimoga district (around 400 kms from Bangalore), Karnataka
- ✓ Immature fruits are exclusively used for making pickles
- ✓ Available in an array of strong aroma ranging from jeera (cumin) to camphor
- ✓ Several types of Appe Midi exist in Sagar area, viz., Barige Jeerige Appe, Adderi Jeerige Appe, Dombesara Jeerige Appe, Genasinakuni Jeerige Appe Barigemane Appe, Kuppe Bordgal Appe, Sudurugate Appe, Kamchappe, Huklu Appe, Kambaduru Appe, etc.

### **Devanahalli Pummelo (*Citrus grandis*)**

- ✓ Unique to Devanahalli Taluk (around 30 kms from Bangalore) and surrounding areas in Bangalore Rural district, Karnataka
- ✓ Owes its name to Devanahalli, where its cultivation is mainly centered. Shallow, well drained, deep loamy soils are highly suited
- ✓ Shape of fruit ranges from round to oblate (top-shaped)
- ✓ Fruit size varies from 20 to 30 cm in diameter, attains yellow colour on maturity.
- ✓ The rind is thick, loose and spongy
- ✓ The pulp is pinkish to red in colour, moderately juicy to fairly dry, and segments can be easily separated
- ✓ Juice has a characteristic blend of sweet and sour taste

### **Mattu Gulla Brinjal (*Solanum melongena*)**

- ✓ It is grown in Mattu, a small village in Udupi district (around 400 kms from Bangalore), Karnataka
- ✓ A unique variety of Brinjal with small spines on the stalk
- ✓ Fruits are round in shape, green in colour with white stripes
- ✓ Invariably used in dishes prepared at the festival held every alternate year since 15<sup>th</sup> century, in the Udupi Sri Krishna temple
- ✓ It has thin skin and virtually gets dissolved on cooking
- ✓ Low astringency

### **Bangalore Rose Onion (*Allium cepa*)**

- ✓ Predominantly grown in Bangalore and Kolar (around 60 kms from Bangalore), districts, Karnataka
- ✓ Bulbs are flattish round in shape, deep scarlet red in colour and 2.5 to 3.5 cm in diameter
- ✓ Special characteristic feature of this variety is its high pungency compared to other varieties
- ✓ Rose onions are mainly exported
- ✓ The high pungency of this variety is influenced by deep, fertile red loamy/alluvial soils

### **Bengalura Mango (*Mangifera indica*)**

- ✓ Also called as Totapuri
- ✓ Widely grown in Bangalore Urban, Rural and Kolar districts in Karnataka
- ✓ A regular and heavy bearing variety
- ✓ Soils with good drainage, and good water holding capacity to a depth of 3-4 m are ideal
- ✓ Fruits are medium to large in size with prominent sinus (beak)

- ✓ Fruits attain yellowish colour with red tinge on maturity
- ✓ Flesh is cadmium yellow in colour, fibreless and firm
- ✓ Sub acidic in taste, moderately sweet, less juicy with good keeping quality, Stone are oblong, curved with short, soft, and sparse fiber
- ✓ Fruits are preferred for processing
- ✓ Raw fruits are used in many delicious chats

### **Bangalore Blue Grape (*Vitis vinifera x Vitis labrusca*)**

- ✓ Widely grown in and around Bangalore and Kolar districts (around 60 kms from Bangalore) in Karnataka
- ✓ Highly tolerant to downey mildew and Anthracnose diseases
- ✓ Berries are spherical to slightly oval in shape
- ✓ Berries on ripening turn to deep blue color
- ✓ Retains its unique color and taste only under Bangalore bio-climate
- ✓ Taste is sub-acidic with strong foxy flavour
- ✓ Fruits have good keeping quality and mainly used for making juice and wines
- ✓ Two commercial crops can be taken annually (Feb-Mar & Aug-Sep)

### **Janagere Jack Fruit (*Artocarpus integrifolia*)**

- ✓ A distinct variety with high fruit quality, grown in and around Janagere village in Magadi taluk (about 60 kms from Bangalore), Ramnagara district, Karnataka
- ✓ This variety is valued for its high quality fruits, which were even appreciated by Sri.Krishna Raja Wodeyar, the then Maharaja of Mysore
- ✓ The fruits are big sized (15-20 kg) and oblong in shape, without any undulations
- ✓ The bulbs are large (5-7 cms), light yellow in color, crisp, firm and devoid of fibres, with excellent aroma and sugar acid blend
- ✓ The seeds are medium in size
- ✓ The fruits are available mainly between April and July
- ✓ Bulbs are mainly used for table purpose
- ✓ Pulp is suitable for dehydration and canning also

## **POTENTIAL CROPS FOR GI REGISTRATION**

### **Fruit crops**

1. Kari Eshad Mango of Ankola (Uttara Kannada district)
2. Rajapuri (Jawari) Banana of Bijapur
3. Ganjam Fig of Srirangapatna, Mandya district
4. Navalur Gauva of Dharwad
5. Anaji Rasabale (Banana) of Davanagere
6. Sompadi Gumless Jack of Puttur (Dakshina Kannada)

### **Vegetable Crops**

1. Seeme Badane (Chow-Chow) of Bangalore
2. Erengere Brinjal of Mysore
3. Rampura Brinjal of Molakalmur taluk of Chitradurga
4. Bili Sawthe (White Cucumber) of Hassan
5. Holada Sawthe (Field Cucumber) of North Karnataka
6. Sambar Sawthe (Sambar Cucumber) of Mangalore
7. Bhatkal Bili Erulli (White Onion) of Bhatkal of Uttara Kannada

## Spice Crops

1. Kari Yele and Ambadi Yele (Betel leaf) of Savanur Haveri district
2. Sirsi Local Arecanut of Uttara Kannada
3. Hirehalli Local Arecanut of Tumkur district

## Flower Crops

1. Haladi Kanakambara (Yellow Crossandra) of Dakshina Kannada district
2. Ramabana Mallige (Ramabana Jasmine) of Dakshina Kannada district
3. Badavanahalli Kakada (Badavanahalli Jasmine) of Madhugiri taluk of Tumkur district
4. Panneeru Gulabi (Panneeru Rose) of Chamarajnaraga district

## Action Plan of the department

The department is working on following issues:

- ✓ Registration of crop specific associations
- ✓ Providing training and capability building of the communities
- ✓ Transfer of GI ownership to local communities
- ✓ Bridging of gaps (technical, policy, administrative, managerial etc.) to develop these crops
- ✓ Creating and providing necessary infrastructure for both domestic and export markets
- ✓ Brand development and promotion of GI crops

Karnataka state has some specific and special variety of fruit crop. These include

## MANGO

Mango is native to India. Mukherjee (1949,1985) opined that this genus might have originated in the region covering Burma, Siam, Indo-China and Malayan peninsula. The species of *Mangifera* occur mainly as complex biotic community in tropical humid forests, sub-tropical rain forests and tropical dry forests/woodlands of Indo-Malayan biogeography realm.



**Alhonso**

**The famous varieties of Karnataka are:** Neelum, Bangalora, Mulgoa, Swarnarekha, Badami, Raspuri, Alphonso.

## Badami



## Description of mango varieties (*Mangifera indica*) in Coastal Karnataka

Sl. No	Local Name	Description
1	Kari Ishad	Very sweet, fragrant, small stone with more pulp, famous in the region.
2	Bali ishad	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	Appemidi	Sour taste, fragrant green fruit best suited for pickles. Some appe-Sap from petile is very fragrant and it is added to the pickle jar as a preservative. It gives distinct and characteristics fragrance, Jirige Smells like jirige, Gund appe, Round type, Kanchuli appe Sour in taste, round small white Udda Appe-round small black, Anantha Bhattana appe Vaerity is specific to a region with distinct aroma and taste.
5	Chalti	Small fruit with light sour and sweet taste used for making chatni and other traditional food, Round, small fruit with sour taste. Raw fruit is used for pickle making. Midi mavu Raw, young fruit is used pickle making. Chandrika mavu Local variety of mango. Fruit is big, sweet and specific aroma and taste after ripen.
6	Banganapalli, Apoose	Improved varieties with good yield, But less resistant to pest and diseases.

## BANANA

Banana is widely cultivated in Coastal 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.

### Description of Banana Varieties (*Musa paradisiaca*)

Sl. No.	Local name	Description
1	Kari bale	Sweet with light sour, thick skin and tasty fruit with longer shelf life.
2	Bargi karibale	Very sweet, thin skin and tasty fruit with longer shelf life.
3	Bidiri mitga	Very rare fruit like elakki, petiole is long, long fruit, small fruit and very sweet.
4	Hooru mitga	Very sweet, thin skin and tasty fruit with longer shelf life. Locally famous and in high demand.
5	Mysore mitga	Slightly sour in taste, thin skin and tasty fruit with longer shelf life.
6	Bud bale	Light sour & sweet at ripe.
7	Onbale	Unripe fruit is used as vegetable.
8	Pachbale (Cavendis)	Sweet, long, big fruit, good taste & high yielding
9	Karbale	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



**Elakki Banana**



**Rasabale**

Bananas are one of the ancient fruits cultivated by man. Mention of plantain in Valmiki's Ramayana (2029 BC), Kautilaya's Arthasatra (250 to 300 BC) and in the famous Tamil classic Silappadikaram (500 to 600 AD) suggests its antiquity and long period of domestication in India (Krishnamurthi and Seshadri, 1958). It was found in Indus valley as early as 327 B.C.

**The varieties grown in Karnataka are:** Dwarf Cavendish (AAA), Roustaa(AAA), Poovan(AAB), Rasbale (AAB, Rasthali), Marabale(Pome,AAB), Monthan(ABB), Elekki Bale(AB, Ney Poovan).

### **GRAPE (Vitis spp.)**

In India Indigenous varieties known as 'rangspay', 'Shonltu White' and 'Shonltu Red' are grown in Himachal Pradesh. Cultivated grapes are believed to have been introduced into the north of India by the Persian invaders in 1300 AD.

**The varieties grown in Karnataka are:** Anab-e-shahi, Bangalore blue, Kali shahibi



**Grapes**

### **GUAVA**



Guava is mainly a self-pollinated crop but cross-pollination is also common. This has resulted in large variability in the seedling population from which promising genotypes have been selected in different agro-climatic regions of the country. The main centre of variability in guava has been the Allahabad area in Uttar Pradesh.

**The famous Karnataka varieties are:** Arka mridula, Bangalore, Lepidoptere-49, Allahabad Safeda, Arka Amulya.



## PAPAYA

The papaya (*Carica papaya* L.) is one of the most important fruit crops valued for its rich nutrient content. Papaya is native to tropical America, its place of origin is said to be in southern Mexico and Costa Rica. It was taken to Manila by Spanish in the mid-16<sup>th</sup> century, and reached Malacca shortly afterwards. It was introduced into India during the 16<sup>th</sup> century. It is grown both in tropical and sub-tropical parts of the world.

In India, variability is seen more because of the open pollination and indiscriminate multiplication using these seeds. In papaya there are two basic types of varieties. Those varieties, which are dioeciously, produce only female and male plants and 'gynodiecious' that produce both female and hermaphrodite plants.

**The varieties that are grown in Karnataka states are:** Coorg Honey Dew, Washington, Sunrise Solo, CO2, Surya and Taiwanese lines.



**PAPAYA**



## SAPOTA

Sapota (*Manikara achras*.) is a popular dessert fruit belonging to the family Sapotaceae. It is believed to have originated in tropical America, taken to the Philippines by the Spanish and from there it has spread to other countries (Purseglove, 1968). In India it is grown in the states of Andhra Pradesh, Gujarat, Karnataka and Orissa. About 30 varieties are reported in India at various places. A number of locally grown genotypes identified include Bhuri patti, Morabba, Kalipatti, Turipatti, Golepatti, Singapuri, Khabari and Chhumukia type. Wild diversity is not observed for sapota as it has been grown over the years by using grafts.

**The famous varieties growing in Karnataka includes:** PKM-1, PKM(S)-4, Kallipatti, DHS1, DHS2, Kirthibarathi.

## JACKFRUIT

Artocarpus is genus of small to large evergreen tree, distributed from Sri Lanka and India to South China and through Malaysia to Solomon Islands. Nine species are recorded in India. The species, *A. heterophyllus* Lam. is grown for their edible fruits and *A. chaplasha* Roxb, *A. hirsutus* Lam. and *A. lakoocha* Roxb., are important timber trees.

*A. cinnamomeus* J.R. & G. Frost, commonly known as bread fruit, is found mainly in West Coast and Western Ghats, *A. heterophyllus* Lam. commonly called as jackfruit is one of the most popular fruits. The tree is indigenous to the evergreen forests at altitudes of 450-1200m.



**JACKFRUIT**

*A. hirsutus* Lam is commonly found in the evergreen forests of Western Ghats from Konkan southwards is fairly common in North Kanara and Kodagu in Karnataka. It requires heavy rain fall, not less than 174 cm annually and thrives well on lateritic soils at the foot of the Ghats. The tree can stand shade, but thrives best with a fair amount of light. It does equally well in the open and withstands exposure to sun after the first few years.

*A. lakoocha* Roxb, is commonly known as monkey jack, In its wild state it is chiefly found in the moist or deciduous forests along the banks of streams and along the site of moist ravines.

**The famous varieties of Karnataka are :** Muttam Varikka, Varikka, Koozha, Navarikka.



**POMEGRANATE**

## POMEGRANATE

Pomegranate (*Punica granatum*) is an ancient fruit, which originated in Persia, Afghanistan and Baluchistan and naturalized in Western India very early. Most of the pomegranate types cultivated in India are of seedling origin and thus providing a wide range of variability with respect of fruit shape, size and mellowness of seed, aril colour, rind colour, sweetness and acidity of juice.

**Some popular varieties Karnataka in are:** Ganesh, Ruby, Bassein Seedless

## ANNUAL PRODUCTION OF HORTICULTURE CROPS

### FRUIT CROPS

Sl.No.	Name of crop	Area (in hectares)	Production (in tones)	Leading district
1	Mango	120833	1189222	Kolar
2	Banana	54788	1345282	Tumkur
3	Cytrus	10690	222556	Bijapur
4	Guava	7054	148219	Raichur
5	Sapota	22106	240152	Kolar
6	Pineapple	2507	129370	Shimoga
7	Pomegranate	12025	133232	Baglkote
8	Jack	6149	198951	Chickmagalore
9	Papaya	3380	198951	Bangalore (U)
10	Ber	3380	221244	Bijapur
11	Sitaphala	2012	16584	Kolar
12	Grapes	10138	185812	Bijapur
13	Fig	5865	5353	Bellary

### VEGETABLE CROPS

Sl.No.	Name of crop	Area (in hectares)	Production (in tones)	Leading district
1	Potato	55820	354217	Hassan
2	Tomato	43180	1142406	Kolar
3	Brinjal	14305	313488	Belgaum
4	Beans	9567	106111	Kolar
5	Onion	134950	969677	Gadag
6	Green Chilli	1088	11554	Belgaum
7	Tapyoka	1088	11554	D.Kannada
8	Sweet Potato	3525	40439	Belgaum
9	Cabbage	6257	129053	Kolar
10	Cauli flower	2606	43154	Kolar
11	Peas	977	13132	Dharwar
12	Ladys finger	7492	60807	Havery
13	Raddish	3678	42276	Kolar
14	Beetroot	2384	38687	Kolar
15	Carrot	3861	73047	Kolar
16	Cluster Bean	1984	30142	Kolar
17	Drum stick	2237	16292	Belgaum
18	Water melon	7292	221006	Kolar
19	Musk melon	391	5331	Belgaum
	<b>Leafy vegetables</b>			
1	Menthy	2471	23128	Belgaum
2	Palak	3234	18599	Belgaum
3	Amaranthus	4402	32539	Kolar
4	Curry leaf	1548	8418	Kolar
5	Ash gourd	1743	33964	Kolar
6	Snake gourd	933	12566	Udupi

7	Bitter gourd	2063	17396	Mandya
8	Ridge gourd	2910	26253	Udupi
9	Pumpkin	1553	36281	Kolar
10	Cucumber	6021	87858	Kolar
11	Little finger	941	15844	Kolar
12	Gherkins	810	12588	Shimoga

### SPICE CROPS

Sl.No.	Name of crop	Area (in hectares)	Production (in tones)	Leading district
1	Pepper	24259	5425	Kodagu
2	Cardamom	21699	2455	Hassan
3	Tamarind	15094	74230	Kolar
4	Ginger	14816	160185	Kodagu
5	Turmeric	10845	60032	Chamrajnagar
6	Garlic	5991	45993	Dharwar
7	Dry Chillies	144707	230430	Tumkur
8	Coriander	9047	10375	Bellary
9	Fenu Greek	348	1155	Raichur
10	Clove	183	283	Udupi
11	Nutmeg	219	291	Udupi
12	Cinnamom	21	6	Udupi
13	Vanilla	3329	1334	Chickmagalore
14	Fennel	14	54	Chickmagalore
15	Dill	138	646	Bijapur

### PLANTATION CROPS

Sl.No.	Name of crop	Area (in hectares)	Production (in tones)	Leading district
1	Coconut	453839	53660	Chickmagalore
2	Arecanut	181396	363193	Chickmagalore
3	Betelvine	6343	100331	Davangere
4	Cocoa	2491	19602	Mysore
5	Oil Palm	2651	13406	Koppal
6	Cashew	73386	95992	Udupi

### COMMERCIAL FLOWER CROPS

Sl.No.	Name of crop	Area (in hectares)	Production (in tones)	Leading district
1	Aster	996	8623	Tumkur
2	Crossandra	1711	7525	Kolar
3	Marigold	4865	44397	Chamrajnagar
4	Jasmine	4426	37586	Bangalore (R)
5	Chrysanthamum	3719	41843	Bangalore (U)
6	Tube Rose			
	Single	893	7721	Mysore
	Double	149	400	Bangalore (R)

7	Gladiolus	167	641	Belgaum
8	Rose	1681	3488	Kolar
9	Bird of Paradise	37	44	Bangalore (U)
10	Salldago/Golden Rod	28	91	Bangalore (U)
11	Calla Lilly	11	17	Bangalore (U)
12	Orchids	5	20	Udupi
13	Carnation	35	58	Bangalore (U)
14	Anthurium	28	90	Kodagu
15	Gerbera	61	84	Belgaum

### MEDICINAL PLANTS

Sl.No.	Name of crop	Area (in hectares)	Production (in tones)	Leading district
1	Sweet flag	50	432	Tumkur
2	Coleus forskholl	73	158	Koppal
3	Long Pepper	38	38	Bangalore (U)
4	Peri winkle	24	67	Koppal
5	Kokum	50	140	Kodagu
6	Isabgol	48	96	Bangalore (U)

### AROMATIC PLANTS

Sl.No.	Name of crop	Area (in hectares)	Production (in tones)	Leading district
1	Dhavana	94	935	Kolar
2	Lemon Grass	381	1543	DK
3	Lavender	30	2	Bangalore (U)
4	Vetiver	94	259	Udupi
5	Citronella Grass	177	427	Bangalore (U)
6	Geranium	36	482	Bangalore (U)



**Lemon Grass**



**Ocimum Sanctum**



## AGRO BIODIVERSITY

Karnataka is an agrarian state known worldwide for its production of coffee, raw silk and sandalwood. The state has a 75% share of the total floriculture industry of the country, About 70% of the people of the state live in villages and 71% of the total population is agriculture dependent. 59% of total coffee produced in the country comes from Karnataka whereas the state is also a major producer of ragi. The major crops grown in the state are : rice, ragi, jowar, maize, and pulses besides oilseeds and number of cash crops. Cashew, coconut, areca nut, cardamom, chilies, cotton, sugarcane and tobacco are among other crops produced in the state.



**Paddy cultivation**



Maize is grown in the northern region of the state Coconut and Arecanut is grown in the southern districts. Cotton is grown in abundance in the Gulbarga District. The Davangere District of the state is a center of cotton industry. The weather conditions in coastal areas make cultivation of fruit orchards favourable. Rice is grown mostly in the coastal districts. The state ranks fifth in the country in the production of oilseed.

Karnataka's soil conditions and climate jointly contribute in growing of several crops Agriculture is considered to be one of the primary occupations for the inhabitants of Karnataka. Majority of the people in Karnataka are involved in growing crops especially in the rural areas. Agriculture in Karnataka has occupied around 12.31 million hectares of land, this comes to 64.6 percent of the total area. The 2001 enumeration accounts for about 71 percent employment as farmers and agricultural laborers. The main season for agriculture in Karnataka is monsoon as irrigation is done in only 26.5 percent of the total cropped area.

In Agriculture Biodiversity what is of great economic significance is the domesticated diversity of plant species made by farmers The long farming tradition , soil, features, topography and rainfall variation have permitted the development of diverse agricultural ecosystems and enormous biodiversity in the region.

The following are identified as hotspots of Agro biodiversity in Karnataka:

1. Cauvery Basin
2. Coastal region
3. Leeward deccan plateau.

## Agriculture in Karnataka is mainly done over 3 seasons:



**Paddy Crop**



- Kharif (April to September)
- Rabi (October to December)
- Summer (January to March)

The Kharif crops in Karnataka comprise millets, paddy (rice), maize, moong (pulses), groundnut, red chillies, cotton, soyabean, sugarcane, rice, and tumeric. It is also known as the autumn harvest as it is cropped with the beginning of the first rains in the month of July. The major Rabi crops of Karnataka are wheat, barley, mustard, sesame, and peas. It is popularly known as the spring harvest in parts of Karnataka. Karnataka is one of the major producers of rice among all other states in India. Rice is the food crop harvested by Karnataka agriculture and sugarcane is the major cash crop. Other cash crops sown in Karnataka agriculture apart from sugarcane are cashews, cardamom, betel (areca) nut, and grapes. The cool slopes of Western Ghats are well-known for coffee and tea plantations whereas the eastern regions are widely known for producing a heavy amount of sugarcane. The north-western region of Karnataka has black soil which supports oilseeds, cotton, and peanuts (ground nuts).

Rich crop landraces and traditional farmer's varieties are pleasant in several pockets. These constitute an invaluable reservoir of genes that are needed by plant breeders for development of superior crop varieties. However, the diversity is being lost from the "natural" habitats due to the expansions of agricultural production to frontier areas and also from the agricultural fields due to the adoption of improved by bid varieties and other technology by the farmers. Hence, scientific management of these invaluable domestic resources has assumed greater significance over time. The wild species and relatives of crop breeding programmes is very important as these resources are likely to play a unique role in the development of new cultivars and also in restructuring the existing ones which lack one or the other attribute. The most important inheritance factor obtained from the wild has been that for disease(s) or pet(s) resistance or drought tolerance.

### **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.

## Traditional and hybrid paddy crops cultivated in Karnataka

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.

## Fragrant paddy cultivated in 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	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.

## Traditional paddy cultivated in Karnataka

Sl. No.	Local name	Description
1	Rajkaime	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	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	Tall variety with small reddish grains, used as raw rice. Variety is resistant to diseases and needs more water.
19	Adenukelte	Small, white, short crop with small grains, with low yield. Long duration (150 days) crop, used as raw (Belthakki) rice.
20	Kamadhari	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	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	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.
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23	Jaddu bhatta	Short variety grown in low laying areas. Small- long grains, good quality rice.
24	Bili pandya	Grown during Khariff season in fresh water, grains are white, round, very good for boiled rice, nutritious and good for body cooling
25	Zigoratogya	Big, reddish grains with good taste, Long duration. Tall variety used as boiled (Kuchalakki) rice.
26	75 days	Short duration crop with medium sized grains. Grown well in short of moisture. Rice is used as raw rice.
27	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.

## **Karnataka agriculture policy for the development of Agriculture in the state**

The Karnataka State has faced severe drought for nearly four years of the Five Year Plan Period, the periodic failure of the monsoon in the last few years is certainly a contributing factor, but the problems of agriculture goes beyond the weather. There has been a loss in the momentum which suggests a deeper problem in our agriculture.

Correcting this must be accorded the highest priority, and hence a comprehensive agriculture Policy for Karnataka with a Ten year time frame. has been framed In addition, the agreement on agriculture under WTO has opened many issues not only in international trade but is also impinging on the domestic agriculture policy, providing new opportunities to farmers to compete in the national and international markets, coupled with contract farming, in the new emerging challenge that has to be met.

Karnataka Agriculture Policy is essentially **Farmer Centric**, and is based on the **Panchasutra**, namely

1. Protect and improve soil health.
2. Conservation of natural resources with special emphasis on water & micro-irrigation.
3. Timely availability of credit and other inputs to the farmers.
4. Integrate post-harvest processing with production process.
5. Reduce the gap between the lab to land in transfer of technology.

### **The important issues that the policy addresses are**

1. Net income of the farmer has almost stagnated for the decades, but at the same time consumer price index for rural areas is increasing, consequently pronouncing income stress in farm sector.
2. The share of the budgetary expenditure in real terms on agriculture as well a developmental expenditure on agriculture to the total has shown declining trend.
3. Exploitation of natural resources is alarmingly increasing causing severe land and environmental degradation.

4. Indebtedness in the farm sector is increasing due to existence of huge credit gap. Large share of indebtedness is due to borrowing from informal sources for consumption needs.
5. The number of small and marginal farmers is increasing at an alarming rate causing not only marginalization of size of holding but also pushing large number below the viable threshold.
6. The social prestige of the farmers is not what it used to be, and recent studies have shown that given a choice the farmer today has strong preference to other vocations.
7. Karnataka has large rainfed areas next only to Rajasthan. The future of agriculture growth in the state depends on this factor which accounts for more than 75% cropped area. Every visit of drought destabilizes the growth pattern as substantial area and population get affected. It takes considerable time to recoup the damage inflicted by droughts, and therefore policy formulations to mitigate the risk to the extent possible have been given due emphasis.
8. Access to credit, and adequate remedial measures, are two important issues that have been addressed in the policy. Measures have been suggested to improve the implementation of crop insurance programme in the state. The policy document emphasizes on strengthening institutions & farmer's organization such as the Raitha Samparka Kendra, Co-operative banking, Agricultural Administration and KAPPEC etc., in order to boost growth in agriculture and rural sectors.
9. In order to step up the net income generated in the farm sector, post harvest management, agro processing and rural industrialization is very essential. The policy documents have identified region-wise location of agro processing units keeping in view the availability of raw material and capital.
10. Horticulture, floriculture and Sericulture are three important sectors which should be vanguards of the on-coming strategy for development. The farmer's distress actually begins at the threshold of agricultural marketing. Recognizing this fact the policy document elaborately deals with agricultural marketing and price sector issues. Policy leads have also been provided to improve the efficiencies and development of this sector through private-public sector partnership (PPP).

### **The policy document sets forth five tasks**

- ✍ First it envisages achieving a growth rate of 4.5 percent per annum in agricultural Gross State Domestic Product (GSDP) during the next decade. That is arrived at by keeping in mind doubling of farm production in the next decade. It is expected that this growth rate will help to increase the net income of the farmer. It will also help to bridge the income differentials between the agricultural sector and the non-agricultural sectors. Employment generation in the farm sector as well as in the allied agricultural sector as well as non-farm sector is the key to provide incremental income across different regions and classes of farmers. In overall policy scenario, this needs to be attended to by dovetailing employment creation in most of the programmes.
- ✍ Secondly, the policy focuses on the bypassed regions as well as bypassed groups of farmers in the process of development. That will deal with regional disparities and providing growth drivers for the weak regions.
- ✍ Thirdly, hitherto the technological change has been supply driven rather than "demand oriented". The distance between the "lab to land" has created a lag in reaching the technology to the doorsteps of the farmer. Therefore, rethinking is essential in generation and dissemination of technological inputs, and making it need oriented.
- ✍ Fourthly, natural resources are under stress, whether it is soil, water or other biological resources. It is very essential to conserve the resources and at the same time, provide

better production environment. The trade-off between production and resources depletion needs to be handled carefully.

✎ Lastly, access to factor market and quality of inputs supplied to the farmers has always been the focus of discussion. At the same time product market imperfections have to be attended seriously.

#### **A few highlights of the policy are:**

- ★ Agriculture Department to be renamed as Department of Agriculture and Farmer's Welfare.
- ★ Target of agricultural growth rate fixed at 4.5 per cent per annum.
- ★ Timely access to credit, Post Harvest value addition, and least time lag between 'Lab to land'.
- ★ Focus on creating opportunities to enhance their net income and employment to a respectable level, making agriculture an attractive proposition.
- ★ Investment in rural farm and non-farm enterprises to increase by 5 percent per annum.
- ★ Budgetary expenditure on development head for agriculture sector to be at 10percent of the total developmental expenditure.
- ★ Raitha Mitra Pusthaka (RMP) a small coded pas book with all information of the farm family will be issued to each farmer that will serve several purposes.
- ★ A planned Programme focusing on improving soil health called as **"Bhoomi Thaiya Arogya"** will be taken up by covering 35,000 hectares each year.
- ★ Proposed to constitute a Rainfed Agricultural Commission under the chairmanship of a technically competent person for constantly designing appropriate strategies for development of rainfed agriculture. This Commission is proposed to be located in northern Karnataka.
- ★ The state will establish Karnataka Trade Authority at the state level.
- ★ Establishment of Telemetric Rain Gauge stations at Grama Panchayath Level in a phased manner.

#### **The state will allow Private - Public Partnership (PPP) Agricultural education.**

- ★ Constitution of farmers' **"Pragatipara Raithara Okkuta"** (PRO) of 10 to 50 farmer members to be encouraged, to facilitate small and marginal farmers undertake farming activities jointly, including post-harvest activities.
- ★ Development of bio-fuels in waste lands to be give major thrust.
- ★ Rural Godowns to be established within the radius of 5 k.m. to help farmers to stock the produce and avoid distress sale. Pledge loan facility to be extended to these farmers. Interest free loan (advance)" to be provided to farmers to the extent of the 50 per cent of the value of the product (at MSP).
- ★ Investment in biotechnology research and extension will be stepped up. Agricultural Universities will endeavor to establish their brand name in the seed and technology sector.
- ★ Krishi-Techno Park at Grama Panchayat level to be established.
- ★ **"Every village a knowledge center"** movement to be promoted.
- ★ Dealership for seed, fertilizers and pesticides to be allowed only to Agriculture Graduates/ Diploma holders, and every input to carry a proper label. Manufacturer and/or the supplier to be made accountable.
- ★ To extend the coverage of Yeshaswini Cooperative Healthcare Scheme to all the farmers and agricultural laborers in the state with adequate budgetary support.
- ★ The state shall endeavor to provide remunerative prices to the farmers' produce by harmonizing domestic prices with world prices and improving the efficiency on marketing system. This would be combined with the policy of supplying quality

products to the consumers at reasonable prices. A market linked insurance scheme to be worked out.

- ★ The state shall endeavor to protect the interests of farmers against distress sale through the Market Intervention Scheme by increasing the corpus of the Revolving Fund. At present this scheme is operated and funded fully from State resources.
- ★ Minimum Support Price scheme will be extended to all the crops of the State, and will be specially tuned to cover small and marginal farmers.

**Agro Biodiversity** is 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. It comprises the diversity of genetic resources (varieties, breeds) and species used for food, fodder, fibre, fuel and pharmaceuticals. It also includes the diversity of non-harvested species that support production (soil micro-organisms, predators, pollinators), and those in the wider environment that support agro-ecosystems (agricultural, pastoral, forest and aquatic) as well as the diversity of the agro-ecosystems.

From the earliest time, rice, wheat and millets have been the staple food for the vast population of the country and the occurrence of charred grains in most of the excavations sites. The literature available in general and of the state and since, evolution of mankind, with parallel evolution of animals especially herbivores gave clues to man that what he can depend upon for his survival. It was this simple understanding that led to recognition of certain plant species that could meet the food requirements of mankind. Man also recognized certain Key stone species viz. that have a large influence on the character of an ecosystem which made him to identify zones of his survival habitats. Nature does everything so perfectly that life can exist in all different hospitable zones of this planet earth.

The Agricultural crop diversity of Karnataka could be classified as follows

Cereals, Millets, Pulse, oil seeds, Plantation crops, essential oils, sugar crops, tuber crops, woods, fiber crops, spices, medicinal plants, beverages, fruits and nuts, vegetables, gums and resins, dyes and tannins, rubber, forage crops.

### **Cereals:**

**Rice:** Major cultivated varieties are BR-2655, Jaya, Mandya Vijaya, Prakash, IET-8116, Tanu, MTU-1001, IR-30864, IR-20, Pushpa, MTU-1010, Rasi, Tellahansa, Mangala, Mukti, MO-4, Phulguna and Hybrids like KRH-1 & KRH-2).

In Karnataka, traditional rice varieties are found mostly in Malnad hilly and Coastal tracts in Shimoga, Hassan, Corrg, Udipi and South Canara districts. These varieties are having long duration, photosensitivity, tall stature and fine grain quality.

Karnataka (Vidya Chandra & Rajanna 2004): Anekombu, Athikaraya, Bangakaddi, Bangarasali, Bangarkovil, Bellary sanna, Bile kagga, Coimbatore sanna, Gajawali, Gudubaliari, Hallugu, Halubballu, Jeerasanna, Kanwa, Karekagga, Kayaura, Keddi, Kembhuti, Kolke, Mascathy, Rajamudi, Ratnachundi Rajboga, Suggi.

1. **Maize:** Major cultivated varieties are Ganga-11, Deccan-103, and Composites like NAC-6002, NAC-6004 and Hybrid variety Nityashri.
2. **Wheat:** Major cultivated varieties are Kiran Dharwad-2006, HD-2189, DWR-16, DWR-39, DWR-162, DWR-195, DWR-225, and DWR-185.

### **Millets:**

**Ragi:** Major cultivated varieties are Indaf-5, Indaf-8, Indaf-7, Indaf-15, Indaf-9, MR-1, MR-6, L-5, GPU-28, GPU-26, GPU-45, GPU-48, and HR-911.

1. Sorghum: Major cultivated varieties are CSH-5, CSH-10, CSH-14, CSH-16, CSH-18, DSH-3, DSH-4, DSV-1, DSV-2, DSV-3, DSV-4, CSV-15, and M-35-1.
2. Pearl millet: Major cultivated varieties are ICTP-8203, ICMV-221
3. Other local varieties of Small millets and Fox tail Millets are also cultivated by the farmers.

In India millets species (Sorghum, Finger millet, Pearl millet, Foxtail millet, Barnyard millet, Proso millet, Kodo millet, Kodo millet and little millet) are commonly cultivated under rainfed conditions. The small millets like Finger millet, Foxtail millet, Barnyard millet, Little millet and Proso millet are found in Karnataka State especially wherever annual rainfall is below 350mm, perhaps where no other cereal crop can grow under such moisture stress.

**Finger Millet:** Also known as Ragi is the most important small millet food crops of Southern Karnataka. It is grown successfully in area where rainfall is about 350 mm and temperatures more than 30 degree Celsius.

**Sorghum:** Also known as Jowar is perceived to be important coarse grained food crop is cultivated in Karnataka. The crop is hardy and cultivated in areas with rainfall beyond 350mm.

**Finger millet:** (Eleusine Coracana, also known as African millet or Ragi in Kannada) is an annual plant widely grown as a cereal in the arid areas of Africa and Asia. Finger millet is originally native to the Ethiopian Highlands and was introduced into India approximately 4000 years ago. Finger millet is often intercropped with legumes such as peanuts (*Arachis hypogea*), cowpeas (*Vigna Sinensis*) and pigeon peas (*Cajanus cajan*).

#### **Pulses:**

1. Pigeon pea (Red Gram): Major cultivated varieties are PT-221, JS-1, Maruti, Asha, TS-3, Pragati, and GC-11-39.
2. Chick pea (Bengal Gram): Major cultivated varieties are Annigeri-1, ICCV-2, ICCV-10, GBS-964, Jg-11, and KAK-2.
3. Black gram: Major cultivated varieties are Karagoan-3, T-9, Rashmi, and TAU-1.
4. Green gram: Major cultivated varieties are PS-16, Pusa Baisaki, PDM84-178, Selection-4, and China Moong.
5. Cow pea: Major cultivated varieties are C-152, TVX-944, KBC-1, KBC-2, and S-488.
6. Soy bean: Major cultivated varieties are Hardi, KBSH-2, KB-79, JS-335, PK-1029, and DSB-1.
7. Horse gram: Major cultivated varieties are local variety & GPM-6.

#### **Oil seeds:**

1. Ground nut: Major cultivated varieties are TMV-2, JI-24, GPBD-4, K-134, ARI-2, S-206, DH-3-30, DH-40, DH-86, R-8808, ICGS-11, and TAG-24.
2. Sesamum: Major cultivated varieties are E-8, DS-1, TMV-3, Navati-1, and T-7.
3. Sun flower: Major cultivated varieties are Morden, BSH-1, KBSH-1, KBSH-41, KBSH-42, and DSH-1.
4. Niger: Major cultivated Varieties are KBN-1, No-71, and RCR-18.
5. Safflower: Major cultivated Varieties are Annigeri-1, A-300, S-144, A-2, and NARI-6.
6. Apart from these crops Castor, Palm oil and Mustard crops are also cultivated



**Plantation crops-** Coconut, Areca nut.

**Commercial crops** like Tobacco (Spurthi, Anand, Bagyashree, Bhavyashree, Trupthi, Bhavya, and AFC special) are also cultivated by the farmers.

**Essential oils** – Lemon grass oil, eucalyptus oil, Pepper mint oil, Jasmine, Sandal wood, vetiver, ginger grass etc,

**Sugar crops** -Sugar cane (CoC-671, Co-7219, Co-8014, Co-86032, Co-740, Co-419, Co-62175, Co-7804, Co-8371), Sugar palm, Sweet Sorghum.

**Tuber crops-** Potato, Sweet potato, Amorphophalus, Colacasia, Arrowroot

**Fiber crops-** cotton (DHB-105, DCH-32, Varalakshmi, NHH-44, DHH-11, Suvida, Banni, Abaditha, Sahana, Ganasha, Gauri, Jayadar, Renuka, DDHC-11), Sun hemp, Hemp,

**Spices-** Black pepper, Cloves, Cardamom, Ginger, Turmeric, Cinnamon, Coriander, Fennel, Nutmeg, Fenugreek, Tamarind, Vanilla,

Black pepper diversity in Karnataka

S.No	Cultivar	Remarks
1	Bilimallegesara	Moderate yielder with light green spikes.
2	Kurimalai	Moderate yielder with medium quality.
3	Karimaratta	Moderate yielder with uniform bearing.
4	Karimalligesara	Moderate yielder with dark green spikes.
5	Malligesara	Common cultivar good in yield.
6	Uddagara	Good in yield and medium in quality.

**Medicinal plants** – Ashwagandha, Amla, Asparagus,

**Beverages,** Coffee, Tea, Cocoa,

**Fumigatories and masticatories,** - Tobacco, Areca nut, Betel leaf

**Fruits and nuts-** Banana, Orange, Grape, lemon, mango, Papaya, Cashew apple, Pomegranate, Guava, Custard apple, Ber, Pine apple, goose berry, cashew nut,

**Vegetables** Brinjal, tomato, Cabbage, Radish, Carrot, Onion, French bean, Green peas, Cluster bean, potato, Bhendi, Lettuce, Capsicums, cucumber, ash gourd, musk melon, gourds, bitter gourd, snake gourd, ridged gourd, etc.

**Forage crops-** Grasses, guinea grass, Para grass, Napier grass, Sudan grass, Lucerne,

**Insecticidas-** Pongamia, Neem, Agave, etc.

### What is happening to Agricultural biodiversity?

The loss of agricultural biodiversity is considered one of today's most serious environmental concerns by the FAO. According to some estimates, if current trends persist as many as half of all plant species could face extinction. Among the many threatened species are wild relatives of many crops – species that could contribute invaluable traits to future crop varieties. It has

been estimated that 6% of wild relatives of cereal crops (wheat, maize, rice, sorghum etc.) are under threat as are 18% of legume species (the wild relatives of beans, peas and lentils) and 13% of species within the family that includes potato, tomato, eggplant, and pepper. Today, 75 percent of the world's food is generated from only 12 plants and five animal species. Of the 4 percent of the 250 000 to 300 000 known edible plant species, only 150 to 200 are used by humans. Only three - rice, maize and wheat - contribute nearly 60 percent of calories and proteins obtained by humans from plants.

There are many reasons for the decline in agricultural biodiversity. The principal underlying causes include:

- **The rapid expansion of industrial and Green Revolution agriculture.** This includes intensive livestock production, industrial fisheries and aquaculture. Some production systems use genetically modified varieties and breeds.
- **Globalization of the food system and marketing.** The extension of industrial patenting, and other intellectual property systems, to living organisms has led to the widespread cultivation and rearing of fewer varieties and breeds. This results in a more uniform, less diverse, but more competitive global market.
- The main cause of the genetic erosion of crops - is **the replacement of local varieties by improved or exotic varieties and species.** As crops are bred to improve over the existing varieties, the new varieties of a crop, preferred by the farmers and the consumers, displaced the older ones, resulting in a continuous reduction in the number of older varieties under cultivation. The present day farmers prefer genetically engineered (GE) varieties of crops, which replace the conventional varieties. Frequently, genetic erosion occurs as old varieties in farmers' fields are replaced by newer. Genes and gene complexes, found in the many farmers' varieties, are not contained in the modern. Some 75 percent of plant genetic diversity has been lost as farmers worldwide have left their multiple local varieties and landraces for genetically uniform, high-yielding varieties.

Traditional land races are important reservoirs of valuable traits and need special attention for future crops. More than 50% of rain fed rice in Karnataka is traditional one, thus sheltering a potential genetic diversity. Drought stress is the major limiting factor for rice production and yield stability under rainfed regions. Diversity was evident in our traditional variety collection, which was more so in Uttara Kannada district. It possesses valuable traits, viz, medicinal properties, nutrition, taste, aroma, tolerance to drought and submergence, and other special uses. Majority of traditional varieties in rainfed uplands tolerate moisture stress and possess strong root system. Land races Dodiga and Navalisali in early and medium maturity groups respectively, are found significantly superior for yield and productivity traits under varied moisture stress situations. Hence these land races are identified as good donors for drought tolerance in future breeding programmes.

### Distribution of rice land races in Northern Karnataka

District	Agro-ecological zone*	No. of land races collected	Land race
Bidar	1	5	Ratansagar, Bile kalavi, Parimala kalavi, karikalavi, Mullukalavi
Bijapur	3	3	Kempunellu, Bilinellu, Sindagi local
Belgaum	9	14	Mediumsali, Shankarpoonum, Jeersali, Somasali, Mascat, Multalaga, Ambemori, Belgaum basmati, Kumud,

			Ambemohr, Karigajavile, Yalakkisali, Manila, Rajamani
Dharwad	8	19	Gopal Dodiga, Dambersali, Dodiga, Champakali, Navalisali, Nadantarsali, Chitaga mugad, Antarsali, Hakkalsali, Udarsali, Bolasali, Nizamshaith, Warisanna, Kayisali, Bangarkaddi, Doddabangarkaddi, Ginasali, Kagisali, Wannar.
Haveri	8	7	Khaima Raja khaima Buddha, Hanagal budda, Hakkal budda, Alur sanna, Mysore sanna
Uttara Kannada	9	22	Marnomi guddabhatta, Murukata bhatta, Zadagi, Padmarekha, Karkal dodiga, Dodda mullare, Chitaga, Konnur bhatta, Kannanur local, Gowrisanna, Shetagi, Karibhatta, Jedikuni, Doddabairnellu, sampige, Halaga, Valya, Ratnachuda, Nereguli, Siddasala, Jiggoritiga, Karikantiga, Bilidadi moratiga, Holesalu chippiga, Sorata, Soratiga, Farm valya, Chipiga, Kareisadi, Honasu, Sannamullare, Honnekattu, Mabane, Bangar kovi, Zaddubhatta, Tirlu hegge, Case bhatta, Hegge, Neermuluga, Vasane sanna, Gandhasala, Beerga, Mysore mallige, Huggi bhatta, dodda valya, Batukoli, bili hegge, Nyare minda, Yedikuni, Adnen kelte, Mal bangarkaddi, Motte bangarkaddi.

### Important traits observed in traditional varieties of rice in Karnataka

Special features	Traditional variety
Drought tolerance	Gopal Dodiga, Dambersali, Dodiga, Champakali, Buddha, bile Kalavi, Maranavami guddabhatta, Manila.
Early vigour	Dodiga, Navalisali, Antarsali, Udarsali, Bangarkaddi.
Tolerance to low fertility	Dodiga, Navalisali, Antarsali, Bolsali, Udarsali, Chitaga Mugad.
Durable resistance to diseases and pests	Udarsali, Karigajavile, Antarsali.
Good cooking quality	Ratansagar, Padmarekha, Rajkhaima, Mysore sanna, Gowri sanna, Shankar Poonam, Wari sanna, Sampige, Alur sanna, Bangar kaddi, Adenkeite, Mala Bangarkaddi, Motte bangar kaddi.
Good quality aromatic rice	Ambemohr, Kagisali, Beeraga, Kumud, Yalakkisali, Huggi bhatta, Karigajavile, Belagaum basmati.
Nutritive and satiety value	Navalisali, Ginasali, Mysore maliige, Gandhsala, Karikalavi, Kempunellu, Honasu.

Good quality popping/puffing	Ratanachuda, Nizamshait, Honnekattu.
Good quality flaking	Udarsali, Valya, snna mullre, dodda valya, Bilinellu.
Medicinal Properties	Chitga, Honasu, Karibhatta, Karikalvai, Karigajavile.
Submergence tolerance	Nereguli, Neermulga, Mutalaga
Weed identification	Nyreminda, Antarsali
Good for Parboiling	Dodiga, Halaga, Honnasu.
Suitable for organic farming	Khaima, Jigguvaratiga, Antarsali.

\* Based on traditional knowledge gathered from farmers

### Statement showing Area under various crops in Karnataka

Sl. No	Crop	Area (in Million Hects.)
1	Rice	1.38
2	Jowar	1.90
3	Bajra	0.30
4	Maize	0.56
5	Pulses	1.65
6	Gram	0.34
7	Tur	0.42
8	Oilseeds	2.16
9	Groundnut	1.02
10	Sunflower	0.74
11	Cotton (production in million bales)	0.50
12	Sugarcane	0.31
13	Tobacco	0.07

## Domestic Animal Diversity

According to the Livestock Census in Karnataka population of Cattle is 104.96 lakhs, Buffaloes 43.21 lakhs and sheep 95.33 lakhs Goats 61.43 lakh and poultry 424.37 lakhs. Livestock and poultry play a vital role in the all-round development of agricultural economy.

**Cow**



**Rabbit**



Karnataka is home state for world famous **Bandur** breed of sheep, **Amrith mahal** breed of draft cattle and **Mudhol hounds**. The state has rich, diversified animal genetic resource. There are well-known specified breeds of livestock & poultry. The livestock species reared in Karnataka include cattle, buffaloes, sheep, goat, pigs, ponies, and rabbits. The poultry species consists of domesticated and other fowls.

The livestock and poultry reared by the farmers are primarily for food, draft, fiber and manure. The dogs and cats are compassion animals. The dogs serve both as watch dogs, guide and as pets, besides serving as sniffers in specialized services.

The present domesticated animals and birds in Karnataka can be mainly grouped in to two main categories viz Indigenous and Exotic. The variants within specified breeds is common. Only 36-40% of livestock are specified breeds. Though there are large number of animals with similar phenotypic characters, characterization & systemic study for describing them as breeds and documentation needs to be carried out.

**Pigs**



**Census (lakh)**

Category	2003	2007
Live stock	283.58	328.11
Cattle	95.95	104.96
Buffaloes	40.23	43.21
Sheep	72.72	95.32
Goats	44.91	61.43
Pigs	3.20	2.77



The different breeds of livestock and their distribution are as follows.

Species/ Breed	Indigenous /Exotic	Geographical distribution/home track/breeding track	Population as per (2007 census) Nos	Remarks
<b>cattle</b>				
Amrithmahal	Indigenous	Hassan,Chickmagalur,Shimoga, Davangere,and chitradurga districts	96,000	Fastest draft breed and pride of Karnataka
Khillar	Indigenous	Belgaum,Bijapur,Bagalkote, , Gulberga ,Dharwad, Haveri districts.	4,52,063	Best draft breed for deep soils

**Amrithmahal**



**Khillar**



Hallikar	Indigenous	Mysore,Chamrajnagar, mandya,ramnagar,bangalore,kolar,tumkur,shimoga , Hassan, chickmagalur, Haveri,Dharwad	19,98,727	Best draft breed for shallow shandy soil pride of Karnataka
Deoni	Indigenous	Bidar and Gulbarga districts	68,815	Dual purpose breed
Krishna valley	Indigenous	Bijapur,Bagalkote,Koppal and Raichur districts(Krishna river belt)	3,764	Pride of Karnataka
Malnad gidda	Indigenous	Western ghats	12,81,507	Known for their disease resistance
Non descript	Indigenous	All districts	44,03,915	Known for their disease resistance
Holstein frescian including cross bred	Exotic	All districts	11,84,744	Best milch breed
Jersey including cross breeds	Exotic	All districts	8,90,436	Best milch breed
Other exotic crossbreeds	Exotic	All districts	1,16,714	Good milch breed

<b>Buffaloes</b>				
Dharwad /Pandharpuri	Indigenous	Northern districts	11,379	Moderate native milch breed
Surthi	Indigenous	All districts	3,61,364	Moderate milch breed of Gujrath
Murrah	Indigenous	Northern districts	1,09,159	Good milch breed of Haryana
Meahsani		Northern districts	888	Good milch breed of Gujrath
Non descript	Indigenous	All districts	38,38,788	Poor milch breeds ,are also used for KAMBALA (sports)

Murrah



Dharwad /Pandharpuri



<b>Sheep</b>				
Bandur	Indigenous	Parts of Mandya district	2,95,723	World famous breed its tasty meat and pride of Karnataka now threatened breed
Deccani	Indigenous	Belgaum ,Bijapur, Bagalkote,Dharwad Haveri,Gadag,Davanngere,Chitrdurga ,Tumkur, Gulbarga,Bidar	14,90,614	Known for its coarse wool used for KAMBLIs
Bellary	Indigenous	Bellary,Raichur,Koppal	17,34,238	
Hassan	Indigenous	Hassan ,chickmagalur	6,46,226	
Yelaga & non descript	Indigenous	Bijapur,Bagalkote ,Raichur	49,11,790	Known for its mothering ability and disease resistance

Kenguri	Indigenous	Bagalkote ,Raichur,Gulbarga ,Bidar	4,38,310	Leggy breed known for its lean meat
Ramboulliet	Exotic	Only government farms	1078	Exotic wool breed
Merino	Exotic	Only government farms Very few in numbers	84	Exotic wool breed
Crossbred		Kolar tumkur, chitradurga, chickballapur	17,473	Dual purpose breeds



**Bandur**



**Hassan**

Goats				
Jamnapari	Indigenous	In few of the organized farms	51,065	Milch breed from uttar pradesh
Shirohi	Indigenous	In few of the organized farms	4365	Dual purpose breed from gujarath/rajasthan
Osmanabadi	Indigenous	Northern districts	2,08,431	Leggy native breed
Nandidurga	Indigenous	Chitradurga and tumkur	6,35,304	Pride native breed
Non descript	Indigenous	All districts	52,25,037	
Boegher	Exotic	In few of the organized farms	20,839	Meat breed from south Africa

**Osmanabadi**



**Nandidurga**



<b>Pigs</b>				
Non descript	Indigenous	All districts ,more in southern districts	2,58,000	Reared under scavenging system
White york shire	Exotic	In few of the organized farms in southern districts	3000	
Durac				
Saddleback				
<b>Dogs</b>				
Mudhol	Indigenous	Bagalkote,Bijapur and Belgaum	28712	Sight hound Pride of Karnataka
Pashmi	Indigenous	Bagalkote,Bijapur and Belgaum	14718	Pride of Karnataka
27 breeds	Exotic	Only in urban areas		
Non descript	Indigenous	All districts		
<b>Cats</b>				
Persian cat		Only in urban areas	Very few	
Norwegian cat		Only in urban areas	Very few	
Non descript	Indigenous	All districts	Number not available	
<b>Horses /ponies</b>				
Tonga ponies /pandharpuri	Indigenous	Only in few of the urban areas, and few farmers		
Through breeds	Exotic	Only in stud farms	Number not available	
Donkeys Non descript	Indigenous			

<b>Rabbits</b>				
Chinchilla	Exotic	Only in few of the organized farms	Number not available	
Russian giant	Exotic	Only in few of the organized farms	Number not available	
Newzealand white	Exotic	Only in few of the organized farms	Number not available	

**Chinchilla**



**Newzealand white**



<b>Poultry</b>				
Non descript	Indigenous	All districts		
Asheel	Indigenous	Districts bordering Andhra Pradesh		
Giriraj	Indigenous	All districts		
White leghorn	Exotic	Organized commercial farms		
Other exotic layer breeds	Exotic	Organized commercial farms		
<b>Ducks</b>				
Non descript	Indigenous	Coastal districts		
Campbell	Exotic	Few in number and in few organized farms		
Quails	Exotic	Few in number and in few organized farms		
Emu	Exotic	Few in number and in few organized farms		
Ostrich	Exotic	Few in number and in few organized farms		
Guinea fowls	Exotic	Few in number and in few organized farms		



**Giriraj**



**Ducks**



## Coral Ecosystem of Netrani Island

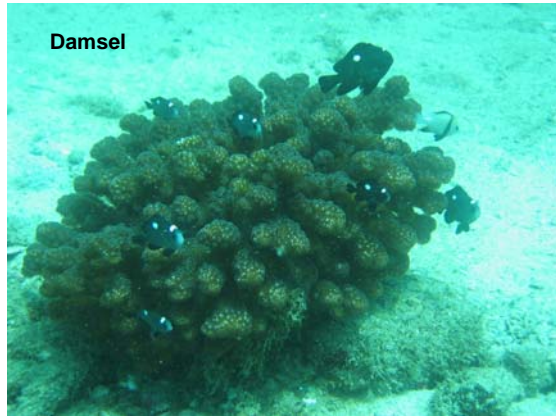
The Netrani Island is located nearly 19 km away from the main land off Murdeshwar Sea depth surrounding this island is 6 to 40 m with water visibility of 15-30 m. The island has existence of a rich fringing coral reef ecosystem around it. The coral ecosystem is very rich in biodiversity with nudibranch, schools of blue trigger fish, fusiliers, groupers, parrot fish, gobies, lion fish and scorpion fish. In a survey conducted during 2005-2006 a total of 89 coral associated fishes were recorded from the area in which 27 species and 4 Genera were the new records from the Indian coast (Table 1). Out of the fishes studied, four fish Genus were reported for the first time from Indian coast. Out of the nine grouper fish species identified from this island, two species such as *Cheilinus undulatus* (endangered) and *Rhincodon typus* (vulnerable) are included in the IUCN red list.

The Survey identified 14 coral species and 4 sponge species from this island (Table-1). The survey identified 15 species of bivalves, 48 species of gastropods and 8 species of nudibranchs from this island.(Table-2). Small giant clams (*Tridacna maxima*) which is protected under the Indian Wildlife (Protection) Act and included in the IUCN Invertebrate Red Data Book as 'Lower Risk: Conservation Dependent' species, was observed from this area. Two species of Palinurid lobsters *Panulrus polyphagus* and *P. versicolor* and one species of shrimp, *Rhynchocinetes durbanensis*, belonging to family Rhynchocinetidae were recorded from the area.

The occurrence of Humphead wrasse at Netrani is very significant. This is in the CITES endangered species list as it has a low recruitment rate and is heavily exploited. This is one of the largest coral reef fish and largest in the family Labridae and most highly sought after fish. This specie is occurring in areas of high coral cover (Sadovy et al., 2003) and larger specimens occur in areas of low coral cover. This is widely distributed throughout Indo-Pacific but at low densities. The distribution of this species along the west coast of India was first studied by Sluka and Lazarus (2005) when they observed five specimens at Vizhinjam-Muttom. The present record is the first one north of Vizhinjam. Live reef fish trade has been the reason for decline in the population of this species in areas of the Indo-Pacific and the biological and ecological characteristics make it vulnerable. The fish grows up to 2.3 m in length.



Lion fish



Damsel

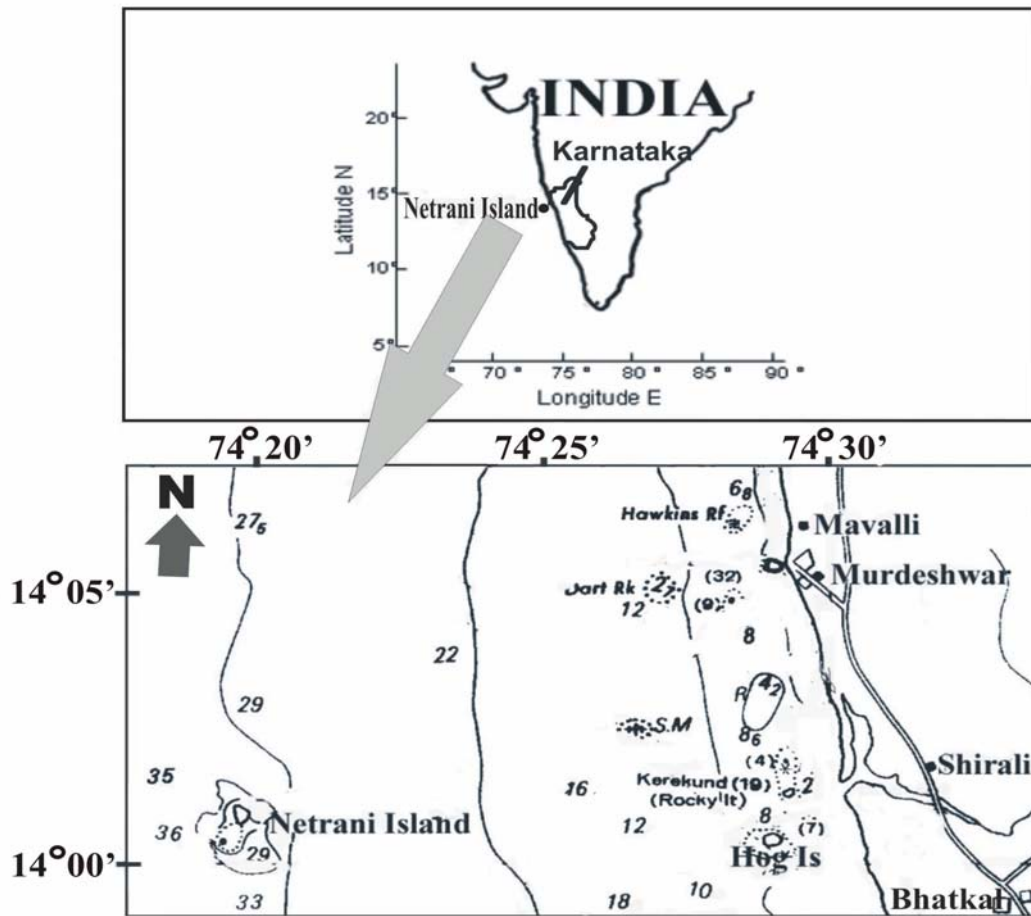


Fig. Map showing the Netrani Island off Murdeshwar along the Karnataka coast.



### Netrani Island

**Table 1. List of corals, sponge and nudibranch species reported from Netrani Island.**

Sl.No	Coral species	Sponge species	Nudibranchs
1	<i>Dendrophyllia</i> sp.	<i>Axinyria flabelliformes</i>	<i>Chromodoris</i> sp
2	<i>Turbinaria</i> sp.	<i>Acanthella elongata</i>	<i>Chromodoris</i> sp
3	<i>Goniastrea pectinata</i>	<i>Echinodictylum longistylum</i>	Glossodoris sp
4	<i>Goniastrea retiformis</i>	<i>Raspailia hornelli</i>	<i>Phyllidia varicosa</i>
5	<i>Plesiastrea versipora</i>		<i>Phyllidiella zeylancia</i>
6	<i>Leptastrea</i> sp.		<i>Thorunna australis</i>
7	<i>Favia fавus</i>		<i>Elysia ornata</i>
8	<i>Sympylla</i> sp.		<i>Pseudobiceros</i> sp
9	<i>Pocillopora verrucosa</i>		
10	<i>Pocillopora</i> sp.		
11	<i>Porite</i> sp.		
12	<i>Goniopora</i> sp.		
13	<i>Sagartia</i> sp.		
14	<i>Coscinarea monile</i>		

**Table 2. List of gastropod and bivalve species reported from Netrani Island.**

Sl.No.	Gastropods	No.	Bivalves
1	<i>Bursa spinosa</i>	1	<i>Anadara antiquata</i>
2	<i>Bursa tuberculata</i>	2	<i>Donax scortum</i>
3	<i>Cerithium morus</i>	3	<i>Mactra (Mactra) achatina</i>
4	<i>Cerithium rubus</i>	4	<i>Mactra (Mactra) turgida</i>
5	<i>Cerithidea cingulata</i>	5	<i>Mactra violacea</i>
6	<i>Terebra tenera</i>	6	<i>Brachidontes striatulus</i>
7	<i>Conus capitaneus</i>	7	<i>Perna viridis</i>
8	<i>Cymatium aquatile</i>	8	<i>Crassostrea madrasensis</i>
9	<i>Cymatium cingulatum</i>	9	<i>Saccostrea cucullata</i>
10	<i>Distortio reticulata</i>	10	<i>Atrina (Atrina) vexillum</i>
11	<i>Monetaria moneta</i>	11	<i>Tridacna crocea</i>
12	<i>Drupa contracta</i>	12	<i>Tridacna maxima</i>
13	<i>Ergalatax margariticola</i>	13	<i>Tridacna sp</i>
14	<i>Drupa tuberculata</i>	14	<i>Dosinia cretacea</i>
15	<i>Drupa xuthedra</i>	15	<i>Gafrarium divaricata</i>
16	<i>Mancinella bufo</i>		
17	<i>Murex malabaricus</i>		
18	<i>Thais carinifera</i>		
19	<i>Thais tissoti</i>		
20	<i>Bullia melanoides</i>		
21	<i>Natica didyma</i>		
22	<i>Natica maculosa</i>		
23	<i>Natica picta</i>		
24	<i>Natica rufa</i>		
25	<i>Nerita albicilla</i>		
26	<i>Nerita oryzarum</i>		
27	<i>Nerita polita</i>		
28	<i>Nerita squamulata</i>		
29	<i>Retina costata</i>		
30	<i>Oliva gibbosa</i>		
31	<i>a (Oliva) amethystina nebulosa</i>		
32	<i>a (Oliva) mantichora intricata</i>		
33	<i>Cellana cernica</i>		
34	<i>Cellana radiata</i>		
35	<i>Cellana testudinaria</i>		
36	<i>Clypidina notata</i>		
37	<i>Planaxis similis</i>		
38	<i>Planaxis sulcatus</i>		
39	<i>Lambis Chiragra</i>		
40	<i>Trochus erythraeus</i>		
41	<i>Trochus radiatus</i>		
42	<i>Trochus stellatus</i>		
43	<i>Turbo brunneus</i>		
44	<i>Turbo coronatus</i>		
45	<i>Turritella duplicata</i>		

46	<i>Turritella terebra</i>
47	<i>Turritella terebra cerea</i>
48	<i>Xancus pyrum</i>



**Table 3. List of coral associated fish fauna reported from Netrani Island.**

<b>Sl. no.</b>	<b>Scientific name</b>	<b>Common Name</b>
1	<i>Acanthurus xanthopterus</i>	Yellowfin surgeonfish
2	<i>Zebrasoma desjardini</i>	Surgeonfish
3	<i>Apogon aureus</i>	Ringtailed cardinalfish
4	<i>Balistoides viridescens</i>	Titan triggerfish
5	<i>Odonus niger</i>	Redtoothed trigger fish
6	<i>Sufflamen fraenatum</i>	Masked triggerfish
7	<i>Caesio teres</i>	Yellow and blueback fusilier
8	<i>Carangoides chrysophrys.</i>	Longnose trevally
9	<i>Caranx melampygus</i>	Bluefin trevally
10	<i>Elagatis bipinnulata</i>	Rainbow runner
11	<i>Megalaspis cordyla</i>	Torpedo scad
12	<i>Scomberoides tol.</i>	Needlescaled queenfish
13	<i>Trachinotus bailloni</i>	Smallspotted dart
14	<i>Chaetodon auriga</i>	Threadfin butterflyfish
15	<i>Chaetodon collare</i>	Redtail butterflyfish
16	<i>Chaetodon decussatus</i>	Indian vagabond butterflyfish
17	<i>Chaetodon dolosus</i>	African butterflyfish
18	<i>Chaetodon plebeius</i>	Bluespot butterflyfish
19	<i>Heniochus diphreutes</i>	False moorishidol
20	<i>Heniochus monocerrus</i>	Masked Bannerfish
21	<i>Himanthura imbricata</i>	Scaly whipray
22	<i>Diodon holocanthus</i>	long-spine porcupine fish
23	<i>Diodon liturosus</i>	Blackblotched porcupinefish
24	<i>Echeneis naucrates</i>	Live sharksucker
25	<i>Amblyeleotris fasciata</i>	Red banded prawn goby
26	<i>Amblyeleotris guttata</i>	Spotted prawn goby
27	<i>Amblyeleotris periophtalma</i>	Periophtalma prawn goby
28	<i>Amblyeleotris triguttata</i>	Triple spot shrimp goby
29	<i>Amblyeleotris wheeleri</i>	Gorgeous prawn goby
30	<i>Elacatinus genie</i>	Cleaner Goby
31	<i>Valenciennesia Sexguttata</i>	Sixspot goby
32	<i>Valenciennesia strigata</i>	Blueband goby
33	<i>Plectorhinchus chubbi</i>	Dusky rubberlip
34	<i>Plectorhinchus vittatus</i>	Indian ocean oriental sweet lips
35	<i>Sargocentron rubrum</i>	Redcoat squirrelfish
36	<i>Cheilinus undulatus</i>	Humphead Wrasse
37	<i>Coris aygula</i>	Clown coris
38	<i>Coris formosa</i>	Queen coris
39	<i>Labroides dimidiatus</i>	Bluestreak cleaner wrasse
40	<i>Thalassoma lunare</i>	Moon wrasse
41	<i>Lutjanus argentemaculatus</i>	Mangrove red snapper
42	<i>Lutjanus bohar</i>	Two-spot red snapper
43	<i>Lutjanus dodecakanthoides</i>	Sun beam snapper
44	<i>Lutjanus fulvus</i>	Blacktail snapper
45	<i>Lutjanus lemniscatus</i>	Yellow streaked snapper
46	<i>Lutjanus rivulatus</i>	Blubberlip snapper
47	<i>Malacanthus sp.</i>	Blanquillo

48	<i>alichthys caeruleoguttatus</i>	Blue spotter leather jacket
49	<i>Mugil cephalus</i>	Flathead mullet
50	<i>Parupeneus indicus</i>	Indian goatfish
51	<i>Gymnothrox eurostus</i>	Abbotts moray eel
52	<i>Gymnothrox favagineus</i>	Laced moray
53	<i>Gymnothrox flavimarginatus</i>	yellow-edged moray
54	<i>Gymnothrox javanicus</i>	Giant moray
55	<i>Gymnothrox thyrsoideus</i>	Greyface moray
56	<i>Ostracion cubicus</i>	Yellow boxfish
57	<i>Platax teira</i>	Tiera batfish
58	<i>Pomacanthus striatus</i>	Yellow bar angel fish
59	<i>Abudefduf sordidus</i>	Blackspot sergeant
60	<i>Amphiprion perideraion</i>	Pink anemon fish
61	<i>Dascyllus carneus</i>	Cloudy dascyllus
62	<i>Dascyllus trimaculatus</i>	Threespot dascyllus
63	<i>Pomacentrus coelestis</i>	Neon damsel fish
64	<i>Pomacentrus philippinus</i>	Phillippine damsel
65	<i>Apolemichthys kingi</i>	Tiger angel fish
66	<i>Ptereleotris evides</i>	Blackfin dartfish
67	<i>Rachycentron canadum</i>	Cobia
68	<i>Rhincodon typus</i>	Whale shark
69	<i>Cetoscarus bicolor</i>	Bicolour parrot fish
70	<i>Chlorurus bleekeri</i>	Bleeker's parrot fish
71	<i>Chlorurus troschellii</i>	Troschel's parrot fish
72	<i>Scarus globiceps</i>	Globehead parrotfish
73	<i>Scarus hoeferi</i>	Guinian parrot fish
74	<i>Dendrochirus zebra</i>	Zebra turkeyfish
75	<i>Pterois antennata</i>	Broadbarred firefish
76	<i>Pterois volitans</i>	Red lionfish
77	<i>Scorpaenopsis gibbosa</i>	Humpback scorpionfish
78	<i>Cephalopholis formosa</i>	Bluelined hind
79	<i>inephelus coeruleopunctatus</i>	White-spotted grouper
80	<i>inephelus flavocaeruleus</i>	Blue and yellow grouper
81	<i>Epinephelus merra</i>	Honeycomb grouper
82	<i>Epinephelus tauvina</i>	Greasy grouper
83	<i>Siganus javus</i>	Streaked spinefoot
84	<i>Spyraena jello</i>	Pickhandle barracuda
85	<i>Synodus indicus</i>	Indian Lizardfish
86	<i>Arothron hispidus</i>	White-spotted puffer
87	<i>Arothron sp.</i>	Puffer
88	<i>Triplerygion tripteronotus</i>	Threefin blenny
89	<i>Zanclus cornutus</i>	Moorish idol

Tridacna clams are the largest living bivalve mollusc. Sessile in adulthood, its mantle acts as a habitat for the symbiotic single celled dinoflagellate algae (zooxanthella). It is included in the IUCN list as vulnerable. Tridacna have so far been reported from Andaman and Lakshadweep islands and the present one is the first report outside these areas. Nudibranchs or sea slugs are the most colourful creatures and soft-bodied snails. They occur world-wide in nature and greatest variation has been seen in shallow tropical waters. They are carnivorous. Some feed on sponges others on hydroids zooxanthella, others on bryozoans and some are cannibals eating other sea slugs.

Coral reefs are one of the most productive ecosystems in tropical waters. These are rich in biological diversity and act as a reserve or preserving and protecting many valuable species. The coral reefs are under threat world wide, mainly due to causes varying from climate change and anthropogenic activities which may result in their destruction and disappearance. The present threat to the coral ecosystem of Netrani Island is mostly human in origin.

### Need for Preservation

Presently Netrani Island is under threat by various anthropogenic activities. The study team noticed the dead corals lying on the side of the island. This is due to the habitat degradation. There is need to protect and conserve the Natrani Island ecosystem



Arothron sp



Scoropaenopsis gibbosa



Chaetodon auriga



Pterois antennata



Gymnothorax Javanicus



Cephalopholis Formosa

## Agriculture Biodiversity of Karnataka

Sl. No.	Name of the Crop	Varieties	District	Special Features
I	Cereals			
1	Rice	BR-2655,	Irrigated areas of South Karnataka	Medium Tall, Grains-Medium Bold, Tolerant to Blast & Stem Borer, Yield-65-75 q/ha.
2		Jaya,	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Uttar Kannada, Shimoga, Chikkamagalur, Kodagu, Hassan	140-150, Dwarf (82 cm), Grains: Long Bold, White, Resistant to Blast, Yield: 50-60 q/ha
3		Mandya Vijaya	Belgaum, Dharwad, Haveri, Gadag	140-145 days, Rainfed Shallow Low Land rice with Tall nature, grains are medium slender; Yield: 55-60 q/ha.
4		Prakash	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum.	140-145 days, Resistant to Green Leaf Hopper, Stem Borer, Bacterial Leaf Blight, Tolerant to Saline & Alkaline soils, Y: 40-50 q/ha
		IET-8116	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya.	Duration 125-130 days, Resistant to Brown Plant Hopper, Grains- Long Bold, Irrigated Lands.
		Madhu (MR-136)	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum.	120-125 days, Tolerant to cold. Grains- medium slender. Suitable for summer planting. Yield: 55-60 q/ha
		Jyothi	Belgaum, Dharwad, Haveri, Gadag	125-130 days, Dwarf, grains: long bold, red, resistant to blast, moderately susceptible to BPH, Yield: 28 q/ha
8		MTU-1001 /Vijetha	Belgaum, Dharwad, Haveri, Gadag	130-135 days, Semi-dwarf (115 cm), grains: Medium slender tolerant to BPH & blast; Yield: 97 q/ha.
9		IR-20	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum.	130-145 days, Semi Dwarf (100 cm), Grains- Slender, Moderately Resistant to Green Leaf Hopper. Y: 50-55 q/ha.
10		Puspha	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum.	125-135 days, High Yielding Variety with Long Slender Grain.
11		MTU-1010	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya.	120-125 days, Grain Long Slender, Y: 40-45 q/ha

Sl. No.	Name of the Crop	Varieties	District	Special Features
12		Rasi	Bidar, Gulbarga, Belgaum, Dharwad, Haveri, Gadag.	125-130 days, Medium Bold, White, Resistant to Blast, Yield: 56 q/ha
13		Tellahamsa	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur, Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya.	120-125 days, Medium and slender seed.
14		Mangala	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Uttar Kannada, Shimoga, Chikkamagalur, Kodagu, Hassan	105-130 days, High yielding, short duration variety, tolerant to cold. Tolerant to Saline & Alkaline soils.
15		Mandya Rani	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	130-135 days, semi-dwarf, high tillering, short duration variety. It has super fine grain.
16		Shakthi (IET-3232)	Uttar Kannada, Dakshina Kannada, Udupi.	120-125 days, A dwarf variety with semi compact habit. Resistance to gall midge and is drought tolerant.
17		Bili Mukti (CTH-3)	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur, Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya.	110-115 days, Grain bold seeded, Yields 30-35 Q/ha.
18		Tanu (KMP-101)	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur, Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya.	130-135 days, medium seeded, Yields 45-50 q/ha.
18		MO-4 (red rice)	130-135 days, Yield: 45-50 q/ha.	
19		Phalguni (IET-2911)	U. Kannada, Dakshina Kannada, Udupi.	135-140 days, A semi-dwarf variety with green stem and foliage.
20		Mahaveer	U. Kannada, Dakshina Kannada, Udupi.	110-115 days, For gall midge endemic areas of South Canara and North Canara in kharif season. Yield: 30 q/ha.
21		Hemavathi (DWR-4107) (IET 13943)	U. Kannada, Shimoga, Chikkamagalur, Kodagu, Hassan.	Duration 160-165 days, Deep Water, Semi-dwarf (100-110 cm), MS, white, resistant to blast, leaf & neck blast; Yield: 45-50 q/ha.
22		Mugad Sugandha-1 (IET-13549)	Belgaum, Dharwad, Haveri, Gadag.	Scented rice variety, Duration 130-135 days, Dwarf (65 cm) grains - LS, moderate resistant to blast, moderate tolerant to LR; Yield: 32-35 q/ha.

Sl. No.	Name of the Crop	Varieties	District	Special Features
23		Amrut (IET 7991)	Belgaum, Dharwad, Haveri, Gadag.	Duration 100-110 days, Grains-Long & Bold.
24		Abilash	Belgaum, Dharwad, Haveri, Gadag, Uttar Kannada, Shimoga, Chikkamagalur, Kodagu, Hassan.	155-165 days, Semi dwarf (105-110 cm), grains: coarse bold; Yield: 35-40 q/ha.
25		IET-15718	Upland Direct	Duration 150-155 days, Dwarf-85-90 cm, Grains-Medium Bold, Resistant to Blast, Yield-35-40 Q/ha.
26		IET-7564	Belgaum, Dharwad, Haveri, Gadag	Duration 110 days, Suitable for rain fed uplands and grains long slender.
27		KRH-1	Irrigated Medium Uplands	Duration 120-125 days, Yield- 60 Q/ha.
28		KRH-2	Irrigated Medium Uplands	Duration 130-135 days, , Yield- 7.40 Q/ha, Grains-Long Bold.
29		Dhanrasi (IET-15358)		Semi dwarf; Grain- SB; resistant to blast, neck blast, Yield : 50-65 Q/ha
30		Sharavathi (IR 57773)	Hill Zone	Tall (130-135 cm); Grain: Bold, dark brown, tolerance to blast disease; Yield: 50-55 q/ha.
31		KHP-9	Low lands of Hill Zone	Plant Height-115-120 cm, Grains: Medium Bold, Tolerant to Blast Disease, Yield-50-52 q/ha.
32		Intan	Belgaum, Dharwad, Haveri, Gadag, Uttar Kannada, Shimoga, Chikkamagalur, Kodagu, Hassan.	160-170 days, Resistant to blast disease, suitable for hilly areas of the State.
33		Tunga (IET-13901)	Mid lands of Hill Zone	Plant Height-90-100 cm, Grains: Long, Tolerant to Blast Disease, Yield-50-52 q/ha.
34		Karna (KMP – 39)	Dharwad,Haveri, Belgaum	130-135 days, Long and bold seed, Suitable for Cauvery basin, Tolerant to pests.
35		Vani	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum.	140-145 days, Long and slender seed.
36		Sona	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum.	140-145 days, Long and slender seed.
37		BPT-5204	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum.	140-165 days, Long and slender seed.
38		IET-7575	Davangere,Chitradurga,Tumkur,Hassan,Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya.	130-135 days, Slender grain, tolerant to Brown Plant Hopper, Y: 45 q/ha.
39		Mukti (CTH-1)	Tank fed areas of South Karnataka	125-130 days, Cold Tolerant Y: 35 q/ha.



Sl. No.	Name of the Crop	Varieties	District	Special Features
40		IET-13549 (DBM-1) (Basumati)	Belgaum, Dharwad, Haveri, Gadag	Far superior in respect of yield & quality parameters compared to local aromatic variety K-44-1
B.1	Maize	Ganga-11,	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	110-125 days, Tolerant to Downey Mildew & Leaf Blight, Y: 55 q/ha.
2		Deccan-103	all zones	110-115 days, Y: 48-50 q/ha.
3		NAC-6002	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga.	90 days, grown in all seasons, Resistant to Downey mildew, Leaf blight & Stem borer.
4		NAC-6004	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga.	120 days, grown in all seasons, Resistant to Downey mildew, Leaf blight & Stem borer.
5		Nityashri (NAH-2049)	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga.	110-120 days, grown in all seasons, Resistant to Downey mildew, Leaf blight & Stem borer, Y: 90-95 q/ha.
6		DMH-1	Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum.	Three way cross hybrid, high yielding, tolerant to leaf blight & Downey mildew diseases.
7		DMH-2	Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	First ever single cross hybrid, resistant leaf blight, moderately resistant to charcoal rot & Downey mildew, 20% > yield than Deccan-103.
C.1	Wheat	Kiran Dharwad-2006,	Bidar, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	High yielding variety, high degree of resistance to leaf blight, leaf & stem rust diseases, tolerant to drought & high temperature stress, attractive grains
2		HD-2189,	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri..	105-110 days, short variety, suitable for chapati & flour making, moderately tolerant to rust disease.
3		DWR-16,	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	105-110 days, short variety, suitable for chapati & flour making, moderately tolerant to rust disease.
4		DWR-39,	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	105-110 days, short variety, suitable for chapati & flour making, moderately tolerant to rust disease.
5		DWR-162	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	High yielding, profuse tillering, suitable for irrigation, tolerant to rust disease.
6		DWR-195,	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	High yielding variety for late sown conditions, resistant to rust.

Sl. No.	Name of the Crop	Varieties	District	Special Features
7		DWR-225,	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	High yielding compared to DWR-162, resistant to leaf rust, 110-115 days duration.
8		DWR-185.	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	Suitable for timely sown conditions with high yielding potential & tolerant to heat.
9		HI 8663	Karnataka	high protein content and stability
II	<b>Millets</b>			
A.1		Indaf-5	Davangere,Chitradurga,Tumkur,Hassan,Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag, Uttar Kannada, Kodagu.	High yielding variety, grown through out the year except winter months.
2		Indaf-8 (Chetana)	Davangere,Chitradurga,Tumkur,Hassan,Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag, Uttar Kannada, Kodagu.	Resistant to Drought & Blast disease, Y: 50 q/ha. (RF)
3		Indaf-7	Davangere,Chitradurga,Tumkur,Hassan,Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag, Uttar Kannada, Kodagu.	Moderately tillering, non pigmented, prolific cock's combing, 115-120 days, good cooking quality, Y: 45-50 q/ha.
4		Indaf-15	Davangere,Chitradurga,Tumkur,Hassan,Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag, Uttar Kannada, Kodagu.	125-135 days, Grain colour brown, seed dormancy-1 and half months
5		Indaf-9	Davangere,Chitradurga,Tumkur,Hassan,Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag, Uttar Kannada, Kodagu.	Pre monsoon variety, High vigour & resistant to cold conditions.
6		MR-1	Davangere,Chitradurga,Tumkur,Hassan,Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag, Uttar Kannada, Kodagu.	Pre-monsoon & Kharif Ragi, 120-13 days, Tolerant to Drought, Y: 40 q/ha

Sl. No.	Name of the Crop	Varieties	District	Special Features
7	Ragi	MR-6	Davangere,Chitradurga,Tumkur,Hassan,Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag, Uttar Kannada, Kodagu.	120-125 days,
8		L-5	Davangere,Chitradurga,Tumkur,Hassan,Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag, Uttar Kannada, Kodagu.	115-120 days
9		GPU-28	Davangere,Chitradurga,Tumkur,Hassan,Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga	Kharif season, 110-115 days, Resistant to Neck blast & blight disease
10		GPU-26	Davangere,Chitradurga,Tumkur,Hassan,Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga.	Summer season, 110-115 days, Resistant to Neck blast & blight disease
11		GPU-45	Davangere,Chitradurga,Tumkur,Hassan,Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga.	Sown in all seasons, 110-115 days, Resistant to Neck blast & blight disease
12		GPU-48	Davangere,Chitradurga,Tumkur,Hassan,Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga.	110-115 days, Resistant to Neck blast & blight disease
13		HR-911 (KBR-1)	Davangere,Chitradurga,Tumkur,Hassan,Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag, Uttar Kannada, Kodagu.	115-120 days, 20%> yield than Indaf-8, Moderately resistant to diseases, Y: 39 q/ha and fodder Yield: 85 q/ha
14	Sorghum	CSH-5	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum.	110-115 days, stem will be green even after harvest of earheads which is useful for fodder.
15		DSV-5	Bidar, Gulbarga, Raichur.	130-135 days, resistant to charcoal rot disease.
16		CSH-14	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	High yielding, Early maturing hybrid.
17		CSH-16	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	100-115 days, variety used to replace CSH-9, susceptible to stem rot disease.

Sl. No.	Name of the Crop	Varieties	District	Special Features
18		CSH-18	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	110-115 days, dual purpose hybrid.
19	Sorghum	DSH-3	Dharwad, Belgaum, Haveri, Gadag.	Kharif Hybrid, 130 days, 25% > yield than CSH-5, Non lodging, good ratooning ability
20		DSH-4	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	High yielding Rabi hybrid, moderately resistant to charcoal rot & rust diseases.
21		DSV-1	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	High yielding, early maturing, suitable for scanty rainfall areas, Bold seeded.
22		DSV-2	Bidar, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	Dual purpose, bold grain, multiple disease resistant, it is ratooning.
23		DSV-3	Dharwad, Belgaum, Haveri, Gadag.	Midge resistant, tolerant to sucking pests & foliar diseases.
24		DSV-4	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	High yielding, Charcoal rot resistant variety, suitable for Rabi season.
25		CSV-5	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	110-120 days, stem will be green even after harvest of earheads which is useful for fodder.
26		CSV-15	Bidar, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	High yielding over DSV-2, Dual & non lodging type, suitable for Kharif.
27		M-35-1	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	125-130 days, Resistant to shoot fly.
28		SSV-74	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	115-120 days, grown only for green fodder & also suitable for Ethanol production.
B.1	Pearl millet (Bajra)	ICTP-8203	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum.	70-80 days, Bold grain, early maturing composite, resistant to blast & Ergot disease & drought tolerant,
2		ICMV-221	Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum.	Open pollinated variety, High yielding compared to ICTP-8203, Early maturing (75-80 days) and Resistant to Ergot & Downey mildew diseases.

Sl. No.	Name of the Crop	Varieties	District	Special Features
C.1	Fox tail Millets	SIA-2642		Moderately resistant to blast & resistant against leaf miners & cut worms
D.1	Proso millets	GPUP-8	Belgaum, Haveri, Dharwad, Gadag.	Drought tolerant, high grain & fodder yield.
E.1	Barnyard	RAU-11		High grain & fodder yield, 90 days, drought resistant, tolerant to shoot fly & smut.
III	<b>Pulses</b>			
A.1	Pigeon pea (Red Gram)	PT-221	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	155-160 days, white & bold seeded.
2		ICPL-87 (Pragati)	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	Early maturing, good quality, suitable for mixed cropping.
3		Asha (ICPL-87119)	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	High yielding compared to TS-3, resistant to Wilt & Sterility Mosaic, 185-190 days, medium bold & red coloured seeds.
4		JS-1	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	160-165 days, high yielding, white seeded.
5		Maruti (ICP-8863)	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	170-175 days, red seeded, Wilt resistant.
7		TS-3	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	High yielding, white seeded variety, resistant to Wilt, suitable for intercropping systems.
8		GC-11-39	Gulbarga, Raichur.	Early maturing, bold seeded, suitable for mixed cropping
B.1	Chick pea (Bengal Gram)	Annigeri-1	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	90-95 days, High yielding variety, Tolerant to drought.
2		ICCV-2 (Kabuli)	Belgaum, Haveri, Dharwad, Gadag.	High yielding & Wilt resistant.
3		ICCV-10	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	Bold seeded (Kabuli), high yielding, resistant to root rot & drought.
4		GBS-964	Bidar, Gulbarga, Raichur.	Tolerant to Wilt.

Sl. No.	Name of the Crop	Varieties	District	Special Features
5		Jg-11	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	95-100 days, Tolerant to Wilt & drought.
6		KAK-2	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	80-85 days, Kabuli variety.
C.1	Black gram	Karagoan-3	All parts of Karnataka	85-90 days
2		T-9	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	70-75 days, sown upto June end.
3		Rashmi	All parts of Karnataka	. 70-75 days
4		TAU-1	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	75-80 days, Bold seeded, wilt & powdery mildew resistant.
D.1	Green gram	PS-16	All parts of Karnataka.	65-70 days duration.
2		Pusa Baisaki	All parts of Karnataka.	65-70 days duration.
3		PDM84-178	All parts of Karnataka.	65-70 days duration.
4		Selection-4	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	High yielding over China Moong, Bold shining seeds, tolerant to shattering, moderatley resistant to powdery mildew & sucking pests, matures in 65 days.
5		China Moong	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	Bold seeded, Early maturing & high yielding.
E.1	Cow pea	C-152	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum.	90-100 days, Better suited for Rainfed conditions, Y: 1200 Kg/ha, Semi determinate variety.
2		TVX-944	Bangalore, Tumkur, Mandya, Kolar, Mysore	100-110 days, Tolerant to Leaf Blight & Rust disease, Y: 9 q/ha.
3		KBC-1	Southern districts of Karnataka	Late Kharif variety, Tolerant to Major Pests, Leaf Blight & Rust, Matures in 90-110 days, Y: 10-12.5 q/ha.



Sl. No.	Name of the Crop	Varieties	District	Special Features
4		KBC-2	Southern districts of Karnataka	90-100 days duration.
5		S-488	Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum.	80-90 days duration.
F.1	Soy bean	Hardee	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	110 days, Introduced from USA, Can be raised either as Irrigated, rainfed or mixed crop with finger millet
2		KBSH-2	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	100 days, Yields 30% > than Hardee
3		KB-79	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	Short duration variety, grown as mined crop in Sugarcane, Yields 12-15 q/ha.
4		JS-335	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	High yielding (30-35 q/ha), early maturing (85-90 days), tolerant to pod shattering & suitable for intercropping systems.
5		PK-1029	Rust disease affected areas	High yielding over JS-335, tolerant to rust, resistant to bacterial pustules, matures in 95-100 days.
6		DSb-1	Bidar, Gulbarga, Raichur.	20-25% High yielding over JS-335, 90-95 days, multiple pest resistant.
G.1	Horse gram	KBH-1	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	110 days, Y: 10-12 /ha.
2		GPM-6	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, Gadag.	
H.1	Avare	Hebbal Avare	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	90-100 days, Good cooking quality, Y: 800 Kg/ha, Non-season bound variety.

Sl. No.	Name of the Crop	Varieties	District	Special Features
2	Avare	Hebbal Avare-3	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	Photo-sensitive, Early maturing (90 days), fully determinate in habit, erect in stature, high yielding (15 q/acre), 24% protein content.
IV	<b>Oil seeds</b>			
A.1	Ground nut	TMV-2	All parts of Karnataka	100-120 days, Kharif & Rabi season variety. Susceptible to leaf spot & insects, Attractive seed shape.
2		Jl-24,	All parts of Karnataka	90-100 days, sown only in Kharif season, Susceptible to leaf spot & insects, seeds bolder than TMV-2.
3		GPBD-4	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Belgaum, Dharwad, Haveri, Gadag.	105-110 days, Late leaf spot & rust resistant, high oil content (48%).
4		K-134	Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur.	95-105 days
5		VRI-2	All parts of Karnataka	100-110 days duration, Sown in Kharif & Summer season
6		S-206	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad.	
7		DH-3-30	Belgaum, Dharwad, Haveri, Gadag, Uttar Kannada, Shimoga, Chikkamagalur, Kodagu, Hassan.	100-105 days duration, High yield even during summer season.
8		DH-40	Coastal Karnataka	Early maturing, high yielding, Erect bunch variety, Higher shelling & red kernels, recommended for paddy fallows
9		DH-86	Belgaum, Dharwad, Haveri, Gadag.	110-115 days, high yielding short variety, Resistant to bud necrosis.
10		R-8808	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad.	120-125 days, High yielding, erect bunch variety, Kharif & rabi seasons, tolerant to bud necrosis.
11		ICGS-11	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	125-135 days, Spreading variety, leaves dark green coloured.
12		TAG-24	Bidar, Gulbarga, Raichur, Dharwad, Belgaum, Haveri, Gadag.	Early maturing (116 days), high harvest index (33.4%) & high shelling (75.6%).

Sl. No.	Name of the Crop	Varieties	District	Special Features
B.1	Sesamum	E-8	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	100-105 days, White seeded, High yielding variety.
2		Navile-1	Hassan, Chikkamagalur, Shimoga, Davangere	Tolerant to Alternaria Leaf Spot & Mildew disease, Matures in 100 days, Seed Y: 6 q/ha
3		DS-1	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	85-90 days, Early maturing, white seeded, high yielding & high oil content (52%).
4		TMV-3	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	85-90 days,
5		T-7	U.Kannada, D.kannada, Udupi.	90-95 days duration.
C.1	Sun flower	Morden	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Davangere Chitradurga, Tumkur, Hassan, Chikkamagalur, Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Haveri.	Dwarf Variety (80-90 cm), Early maturing (75-80 days), Y: 800 Kg/ha., Oil content of 38-40 %, Ideally suited for mixed & cash crop
2		BSH-1	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	High Yielding: 17 q/ha, Uniform in Maturity, More tolerant to drought & diseases, Both dryland & irrigated, High Self-Fertility requiring high seed rate.
3		KBSH-1	all SF growing areas	Rainfed & irrigated, 95-100 days, Moderately resistant to rust & other foliar diseases, Y: 15 q/ha, Oil content: 42-44%
4		KBSH-41	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	90-95 days duration.
5		KBSH-42	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	90-95 days duration.

Sl. No.	Name of the Crop	Varieties	District	Special Features
6		KBSH-44	Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur, Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Haveri, Gadag.	90-95 days duration, 36-37 % oil content.
7	Sun flower	DSH-1	Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	Early maturing & high yielding hybrid, resistant to Downey mildew, high in Oleic acid content.
8		RSFH-1		Resistant to rust & tolerant to <i>Alternaria</i> leaf blight, High oil content.
D.1	Niger	KBN-1	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur, Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	80-90 days duration.
2		No-71	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	90-100 days duration, High cluster formation & High yielding variety.
3		RCR-18	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	95-110 days duration, High yielding variety over No-71.
E.1	Safflower	Annigeri-1	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur, Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Haveri.	115-120 days duration
2		A-300	Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur, Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Haveri.	115-120 days duration
3		S-144	Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur, Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Haveri.	125-130 days duration

Sl. No.	Name of the Crop	Varieties	District	Special Features
4		A-2	Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur, Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Haveri.	120-125 days duration, Compact variety with high oil content (33%) compared to A-1.
5	Safflower	NARI-6	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur, Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Haveri.	125-130 days duration, Thornless variety.
F.1	Castor	GCH-4	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur, Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Haveri.	150-180 days duration, Tolerant to Wilt & Tolerant to sucking pests, High yielding hybrid.
2		NPH-1 (Aruna)	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur, Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Haveri.	Short duration short variety, suitable for rainfed & irrigated areas, Capsules swollen but seeds are of small size.
3		48-1	Bidar, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	150-180 days duration, Wilt resistant variety & tolerant to drought
4		DCH-32	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur, Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	160-180 days duration
5		DCS-9 (Jyothi)	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur, Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	140-150 days duration

V	Commercial Crops			
Sl. No.	Name of the Crop	Varieties	District	Special Features
A.1	Sugar cane	KHS-2045	Mandya	Non arrowing, low fiber, Yields 20 % more than Co-419 under late planting
2		Co-62175	All over Karnataka	Mid late variety with less fiber content, Yields 30% more than Co-419, Susceptible to drought.
3		B-37172	Mandya	Non arrowing, Early variety, Yields 25% more than Co-419.
4		CoC-671	Bhadra command area	Short duration variety, 10-11 months duration.
5		Co-7219 (Sanjeevini)	Belgaum, Bidar	Medium duration variety, Substitute to Co-740, 12-14 months cane, retains quality till 14 months, Y: 120 t/ha.
6	Sugar cane	Co-8014 (Mahalakshmi)	Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	Medium duration (12-13 Months), 20% > yield over Co-740, Tolerant to Smut, responsive to fertilizer & irrigation.
7		Co-86032 (Nayana)	All over karnataka except in problematic soils.	12-14 months duration, Superior over Co-8014 in yield (110-160 t/ha), suitable for spring planting & protective irrigated condition.
8		Co-740	All over Karnataka	Long duration (12-15 months)
9		Co-419	all over Karnataka	12-16 months duration, yields 80-140 t/ha.
10		Co-7804	all over Karnataka	12-14 months cane, used as supplement to Co-419, 12-15 % higher cane yield, 14-15 % higher sugar recovery, Tolerant to <i>Helminthosporium</i> , Y: 145-165 t/ha
11	Sugar cane	Co-8371 (Bheema)	All over Karnataka	12-13 months duration, Y: 10 t/ha.
B.1	Tobacco	Bhavya		
			Hassan, Chikkamagalur, Davangere, Mysore, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	Tolerant to moisture stress, blank shank & root knot nematodes, Y: 15 q/ha.
2		Anand-119	Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri,	High yielding, good quality tobacco, 160 days, tolerant to drought & leaf scorching.
3		Bhagyashree	Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri,	Good quality, resistant to stem rot & root knot disease, duration 175 days.
4	Tobacco	Bhavyashree (NPN-22)	Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri,	High yielding, resistant to aphids & black shank disease, 175 days duration.



Sl. No.	Name of the Crop	Varieties	District	Special Features
5		Spoorthi PL-5	Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri,	170 days duration, suitable for rainfed & irrigated conditions.
6		Thrupthi (KST-19)	all over Karnataka	155-175 days duration.
7		VFC Special	Hassan, Chikkamagalur, Davangere, Mysore, Shimoga, Belgaum, Dharwad, Haveri, Gadag.	150-170 days duration.
C.1	Cotton	Abaditha	Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	Early maturing, high yielding, bollworm tolerant, fibers suitable for 40 counts.
2		Arunabha		High yielding, high ginning & suitable for 50 counts
3		DHB-105	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Shimoga, Mysore, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri, U.Kannada, Kodagu.	180 days, tolerant to leaf reddening. Long staple length, Inter-specific, Higher yielding (20-25 q/ha) than DCH-32.
4	Cotton	DHH-11	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	Intra-hirsutum hybrid, 25-30 q/ha (Irrigated), Tolerant to boll worms, spins for 40-50 counts yarn.
5		DHH-543 (Suvidha)	Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	High yielding, moderately resistant to <i>Alternaria</i> , bacterial blight & grey mildew, tolerant to Leaf hoppers & boll worms.
6	Cotton	DCH-32 (Jayalakshmi)	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Shimoga, Mysore, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Koppal, Gadag, Dharwad, Belgaum, Haveri, Uttar Kannada, Kodagu.	190 days, Long staple length, 15-20 q/ha.
7	Cotton	Varalakshmi	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Shimoga, Mysore, Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Koppal, Gadag, Dharwad, Belgaum, Haveri, Uttar Kannada, Kodagu.	190 days, Long staple length, 15-20 q/ha.
8	Cotton	NHH-44	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	160 days, repeated flowering.
9		Banni (NCH-145)	Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum,	Irrigated areas, 165 days, Bolls big size.
10	Cotton	Sahana	Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	160 days, Moderately resistant to bollworms, 18-22 q/ha.

Sl. No.	Name of the Crop	Varieties	District	Special Features
11		Jayadhar	Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	Rainfed areas, 200days, Tolerant to Pests & Diseases, suitable for inter cropping.
12	Cotton	Renuka	Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum,	Rainfed areas, 190 days.
13		DDhc-11	Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	High yielding, resistant to bacterial blight & moderately resistant to <i>Alternaria</i> blight & grey mildew.
14		DLSa 17 (Gunavanti)	Gulbarga, Raichur, Bagalkot, Bijapur, Bellary, Davangere, Koppal, Gadag, Dharwad, Belgaum, Haveri.	High yielding, resistant to grey mildew disease & sucking pests, tolerant to bollworms, good fiber properties.
	<b>Fodder Crops</b>			
A	Napier Grass	BH-18	Suited for all types of soils.	Hybrid Napier grass, Resistant to <i>Helminthosporium</i> , Y: 150 t/ha of green fodder in 7-8 cuttings
B	Guinea Grass		Suited for all types of soils.	Suited for normal fertility soils & drylands, Yields 35-40 t/ha
C	Rhodes Grass		Suited for all types of soils.	Fast growing Multiple year variety, 7-8 cuttings, 30-40 t/ha.
D	Bajra	Deena Bandhu	Davangere, Chitradurga, Tumkur, Hassan, Chikkamagalur Tumkur, Bangalore (Urban), Bangalore (Rural), Kolar, Chikkaballapur, Mysore, Chamarajanagar, Mandya, Shimoga.	Y: 50-55 t/ha of green fodder in 65-70 days, Tolerant to foliar disease & pests.
E.	Fodder Maize	African tall	All over Karnataka	High fodder yield with good quality.