

COMPARATIVE STUDIES OF FLORA (MAINLY HERBS AND SHRUBS)

IN AN AGRO-ECOSYSTEM ADAPTED TO
ORGANIC AND CHEMICAL FARMING

IN PADETTI, ERIMAYUR, PALAKKAD DISTRICT, KERALA

PHASE-II

Dr. M. A. SURAJ

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DEPARTMENT OF BOTANY
SREE NARAYANA COLLEGE
ALATHUR, PALAKKAD, KERALA, INDIA

SEPTEMBER 2011



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Title of the project Comparative studies of Flora (mainly herbs and shrubs)
in an agro ecosystem adapted to organic and chemical farming
in Padetti, Erimayur, Palakkad District, Kerala – Phase II

Objectives 1) Assessment of Flora (mainly herbs and shrubs) to be carried
out in organic and chemical farming paddy fields and adjoining
bunds during the months of January to September
2) Quantitative assessment of Flora in this area to be
carried out during this period

Name of the Institution **Sree Narayana College**
Erattakulam P.O., Alathur, Palakkad-678 682



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Dr. MA Suraj



1. INTRODUCTION

Palakkad District of Kerala, once heart land of rice cultivation fed by Bharathapuzha and its tributaries, was famous for its palm bordered paddyfields, vegetable farms and lush forests. The District has a rich tradition and culture, especially in farming and water conservation. By using traditionally standardized harvesting techniques and wise use of available water, they efficiently managed their agriculture. Bharathapuzha, the longest river in Kerala, with its 14 tributaries flows through the district. There are 12 reservoirs in Palakkad District, of which seven are major ones. Apart from the temporary Kokkarni's, there are nearly 10,000 ponds and more than 2,000 perennial streams. According to the official figures, nearly 31 per cent of the total land area is under forest cover. Compared to other Districts of Kerala, topography of Palakkad District is suitable for rain water retention. However, now the District has been transformed into the most

water-scarce and drought-hit, so turned out to be the agriculturally pathetic District in Kerala. The story of Palakkad is an example of what is happening to the once agriculture rich, water rich, tradition rich, cultural rich Kerala. Agro-based lifestyle is gone forever, the climate has changed, the rainfall has dwindled and the rivers have dried up, the region has lost its glory. When compared to the so called developmental booming and modernization in human life style, quality of life and infrastructure development in very essential basic fields did not improve much over the years. Along with that the traditional sectors did not improve their performance and small, decentralized and sustainable basic projects were never the priorities of our authority, which made the situation worst.

A silent revolution is taking place in the Erimayur village of Palakkad District, perhaps one of the most drought hit and chemically polluted paddy lands in Palakkad District (Narayanan, 2005). Erimayur is now trying out many methods for reviving the agriculture, soil health and water conservation finally the human life by implementing better management practices in basic sectors. People, especially farmers, are beginning to understand the need of improved bio-farming, water conservation, etc. It is indeed an



ambitious programme, the first of its kind in entire Kerala with the concept of a Bio-village. The active involvement and participation of the local people have given it an added dimension. On its successful completion it will be a model project for the entire country.

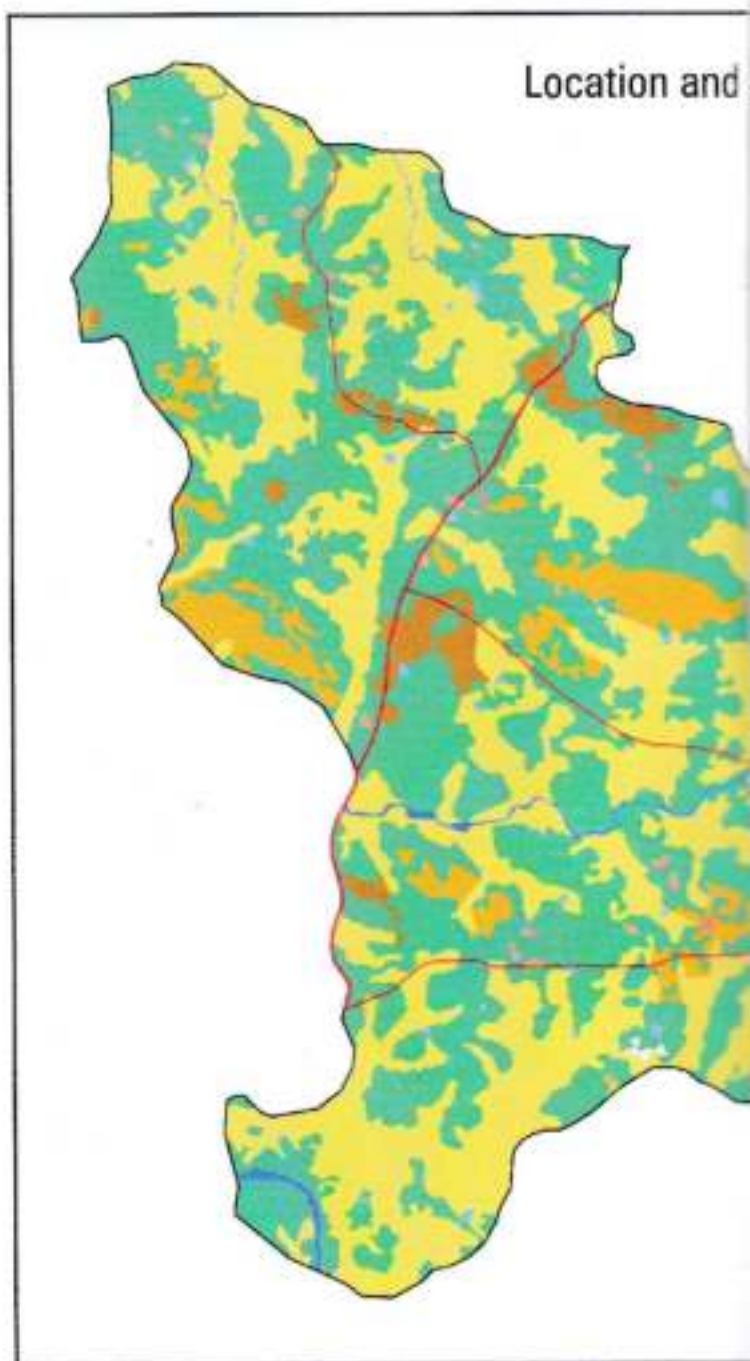
The proposed study aimed to assess the floristic configuration in various agricultural systems in Padetti, Erimayur, so as to generate scientific basis for better management of agriculture ecosystem and sustainable utilization of available land. During the first phase of the study detailed data regarding vegetation were collected from the entire ecosystem, consisting of paddylands, natural forests, homesteads, etc. (Suraj & Sujanapal, 2009). The main objective of the Phase-II study is to provide qualitative and quantitative study of flora in the Padetti paddyfields following organic and chemical farming.

2. Location and Area

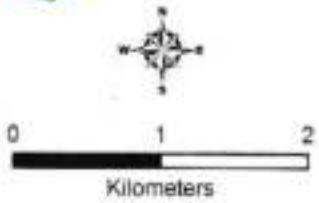
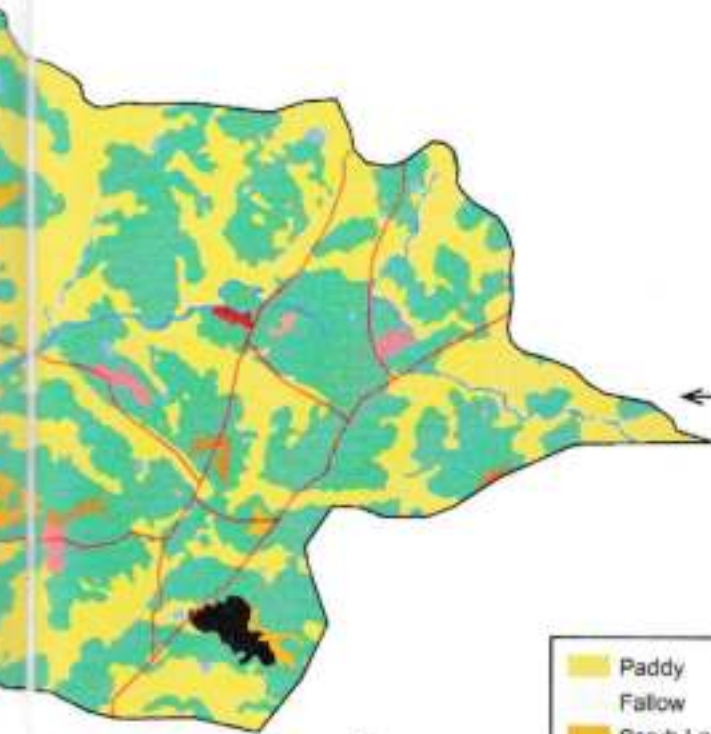
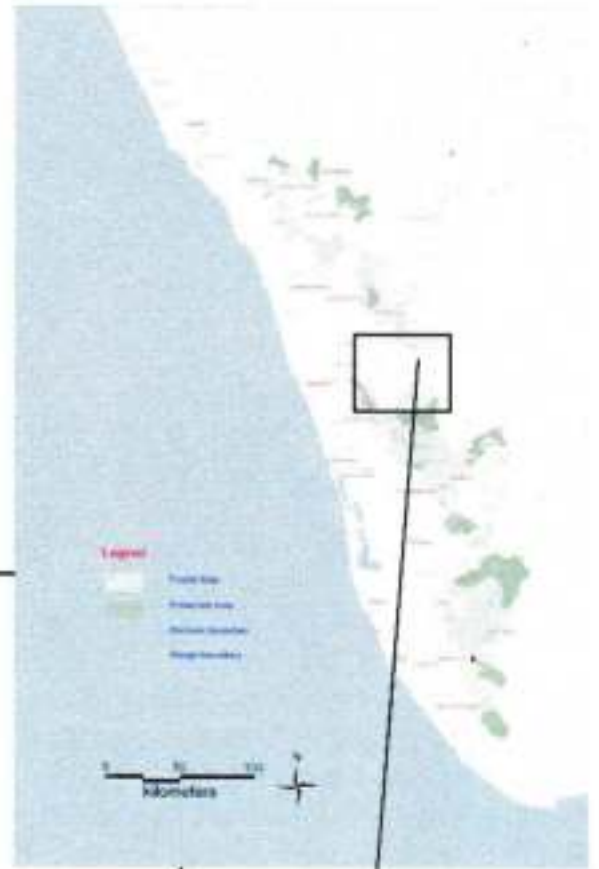
The entire Padetti region of Erimayur Grama Panchayath in Palakkad District of Kerala had been selected in the first phase for detailed study. An area of about 100 acres of Paddy land in the Panchayath between $76^{\circ}27'30''$ and $76^{\circ}32'55''$ E longitude and between $10^{\circ}36'20''$ and $10^{\circ}40'47''$ N latitude following chemical and organic cultivation has been subjected to intensive study in the second phase. Most of the area of this low land terrain is bordered by natural forests with rocky patches and nourished by streams such as Erimayur thodu, Kurudan thodu, Kurukkanparambu thodu. This natural forests and paddy fields form an important catchment for Gayathri Puzha. Since the area of study is surrounded by hilly tracts with natural vegetation of moist deciduous nature (Chandrasekharan, 1962), topographically it is isolated, which made the region ideal for biofarming or other unique agricultural or land practices (Kristen Blann, 2006).

Last year the area received rich monsoon showers. June onwards up to August was peak periods for rainy days, unlike other parts of Kerala the north-east monsoon is negligible. The average rainfall during this period is 1200 mm, and comes from the south-west monsoon.

Average minimum temperature in this region is 27°C and average maximum temperature is 38°C (Erimayur Grama Panchayath, 2011). During the peak of summer days, the temperature may reach up to 41°C . Important climatic factor in this region is "Palakkadan kattu" (Gap wind). This type of wind is normally seen during December month to the end of summer season. Gap wind influences the climate of this 'gap land'. However the surrounding natural forest and homesteads protect this region from gap wind to a certain extent.



Land use of Erimayur Panchayath



 Paddy	 Mining Quarry
 Fallow	 Village
 Scrub Land	 Town
 Open Land	 River/stream
 Homesteads	 Water bodies
 Rocky Area	 National Highway
	 Other Roads

3. People's participation and awareness on bio-farming

Over the decades, it was clearly recognized that the 'top-down' approach characteristic of traditional development strategies has largely failed to reach and benefit the rural poor (FAO, 1991). Now the authorities realized that people's participation is an inevitable mechanism for promoting rural development. Many successfully completed projects proved that mobilizing local knowledge and resources is essential for self-reliant development and, in the process, reduce the cost to governments of providing development assistance. People's participation is largely recognized as an essential element in strategies for sustainable agriculture, since the rural environment can only be protected with the active collaboration of the local population. People's participation should be viewed as an active process in which people take initiatives and action that is stimulated by their own thinking which they can effectively influence. Participation is therefore more than an instrument of implementing government projects.

One of the most important peculiarities of the biofarming and related activities in the Padetti is the active involvement of inhabitants in the area. They are gradually switching on to biofarming and traditional practices because of the lessons from modern agriculture, practiced in the area for a long time. Continuous assistance and



Interaction with local farmer

scientific support is necessary, especially during this transforming stage towards a sustainable bio-village. Since Padetti is the model area because of the land and culture, on its completion, this region serves as an ideal centre for disseminating messages about sustainable bio-farming. Students should be an integral part of this programme, so as to spread and practice the useful lessons for a long time. During the short survey, we tried to integrate the studies with students, especially botany students in the District. Many students from colleges like Govt. Victoria College, Palakkad; SN College, Alathur, etc participated in the floristic study. During this study we were able to introduce the system especially, traditional land practices, bio-farming, etc to these key people. This is only a precursor towards this large endeavor. Large scale campaign is very essential for popularizing this eco-sustainable concept in the contemporary world.

Students of SN College, Alathur & Govt. Victoria College, Palakkad at Padetti Organic farming area





4. Pre-harvest(September) & post-harvest(May) scenarios in paddyfields

Major floral component in the paddy and allied systems are herbaceous, dominated by grasses and sedges. Most of this habit forms are weeds. Regeneration of weed is highly seasonal, also various agricultural practices in the paddy fields obstruct the growth, so established floral stands follows various diversity pattern with respect to prevailing condition in the area. It influences the systematic assessment of weeds. For overcoming these constraints and to generate most reliable data, the cropping pattern and life cycle of paddy from sowing to harvesting were analysed and most suitable seasons with maximum weed diversity were selected for assessing the pattern. Post-harvest season during May and pre-harvest period during the month of September were selected as two broad categories, which

are found comparatively less disturbed. These two seasons are falling in wet and dry climate. Continuous observations have shown that the data is more or less compatible with the actual data from a virgin unmanaged paddyfields. In dry climate (May-post harvest), woody forms are dominant when compared to grass and sedge flora, while in wet climate delicate plants including grasses and sedges are prominent. These vegetal dynamics were assessed using sample plots. In this way, both chemical and organic farming were assessed, which provides comparative seasonal data in two systems.

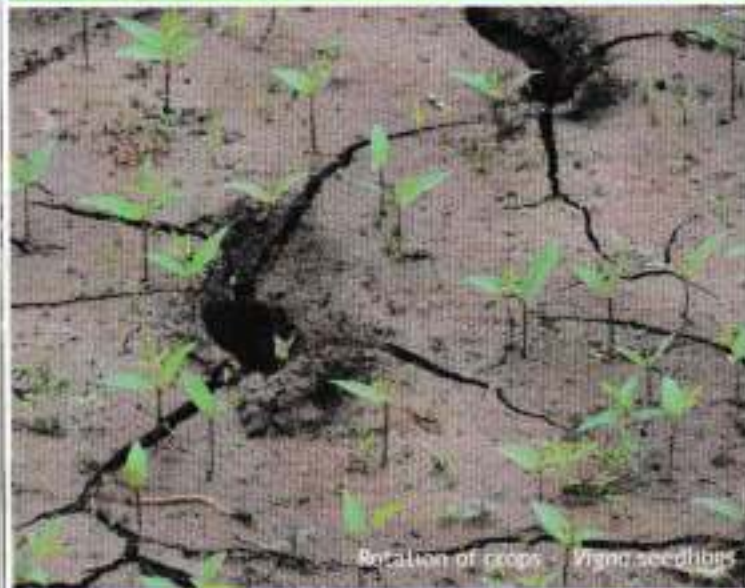
5. Arborescents and utilization of bunds in paddyfields

Palakkad is a picturesque land bordered by mountains and showcases a different landscape dotted with palms and paddyfields. Paddyfields are extraordinarily scenic with palms, arranged





Insectivorous bird - Drongo



Retention of crops - Vigna seedlings

along her buds providing shape and shelter to the region and its living beings. Palmyra palm, *Borassus flabellifer* and Neem tree, *Azadirachta indica* is very common along the bunds in most of the paddyfields in Palakkad, also in Padetti. These species naturally growing in the area, also farmers promote their growth in places where their natural regeneration is low. Apart from an additional income provider, *Borassus flabellifer* has some important ecological role, since these palm act as a home for many birds and agro-friendly mammals and reptiles. Similarly, along with the profound benefits in the form of ecological value, *Azadirachta indica* acts as a natural bio-pesticide or insecticide. Now Coconut tree has become an integral part of the paddyfields and farmers largely prefer Cococs in broader part of the bunds. Some indigenous trees like *Morinda pubescens*, *Careya arborea*, etc. are also seen in the area, though their population is very low. *Gliricidia sepium* is another tree species used for biofencing between the vayal and adjacent highland plots, which provides quality organic manure.

Farmers in Padetti utilize the available land in bunds for small scale cropping. While these crops provide vegetables for their daily use, it acts as a natural bio-shield from the pest attacks between the adjacent paddyfields. They are using variety of vegetables and grams, mainly multipurpose legume like Koluwith (Grams),



Tradition method of weed control - weed submerged in water

Muthira (*Cajanus*), Payar (*Vigna*), etc. for bund planting, which is otherwise a nitrogen provider. Vegetables such as *Abelmoschus*, *Lycopersicum*, etc. are also cultivated along the bunds. After the introduction of organic farming, farmers in Padetti intensified the off-season cultivation in paddyfields with Uzhunnu (Black gram), Payar (*Vigna* spp), etc., which improves the quality of land. This has a high agro-ecological significance.

6. Weed management in traditionally managed Paddyfields

Farmers, especially the traditional farmers in Padetti have their own practices for reducing weed intensity in paddyfields. In organic farming area they are practicing traditional methods along with physical weeding for weed control. They start their weed control work on the beginning of ploughing itself. Physical removal of weeds before their flowering and fruiting stage and burning them are the methods practiced in pre-ploughed paddyfield. Controlled burning using dried weeds along with other leaves are practiced in ploughed area. For collecting leaves they preserve trees in their homesteads, also collect leaves from adjacent natural forests. So, preserved groves or protected trees are always associated with paddyfield. Since the seeds of weeds have long term viability and dormancy, there are chances of weeds from the dormant seeds during different stages of paddy growth. For removing these weeds, the seeds are allowed to germinate by applying limited quantity of water. After their germination the area is filled with water for few days. By maintaining water table in the field for various durations, most of the weeds will die. Along with these practices, two-time physical weeding help to eradicate majority of weeds from paddyfield during cultivation. However, this weeding practice is expensive and influenced by water availability.

7. Methodology

In the first phase of study entire Padetti micro-watershed area was enumerated for floristic diversity and structure, however in second phase studies intensified to explore the paddyfields

(vayal and its bunds) for getting micro level data regarding vegetation structure. Only a few selected homesteads were analysed for vegetation pattern. For assessing the floristic structure and composition in chemical and organic farming paddy fields, two seasons such as May and September in a broad category of post and pre harvest scenarios were selected and enumerated. Identification and systematic enumeration using sample plots were carried out in these habitats during January to September 2011. Stratified random sampling technique was adopted for structural and compositional analysis. Herbaceous flora with sapling and seedling of trees were enumerated for analyzing the vegetation structure and plot size was fixed as 1x1 m. (Muller-Dombois & Ellenberg, 1974). A total of 180 sample plots were randomly laid out in the Paddy cultivating and nearby homesteads of Padetti-Erimayur bio-farming area (Table. 3).



Table. 3. Distribution of sample plots in various habitats

No	Area	May (Post-harvest)		September (Pre-harvest)		Total
		Organic	Chemical	Organic	Chemical	
1	Vayal - Paddy field	20	20	20	20	80
2	Bund	20	20	20	20	80
3	Homesteads	20	-	-	-	20
Total		60	40	40	40	180

7.1. Structural and compositional analysis

7.1.1. Density (D)

Density is used to describe the general nature of vegetation (Bharucha & De Leeuw, 1957). It is a measure of dominance, an expression of numerical strength of a species in a community and relates to the counting of individuals per unit area. It is calculated as follows.

$$\text{Density (D)} = \frac{\text{Total number of individuals}}{\text{Total number of quadrats studied}}$$

The relative numerical strength of a species with respect to total number of individuals of all species form another useful comparative figure called Relative Density (RD) which were determined according to Phillips (1959).

$$\text{Relative Density (RD)} = \frac{n_i}{N} \times 100$$

(where n_i = number of individuals of i th species; N = total number of individuals of all the species).

7.1.2. Frequency (F)

This is a measure of estimating abundance. It indicate the number of sampling units in which a given species occur and so expresses the distribution and dispersion of various species in a community

$$\text{Frequency (F)} = \frac{\text{Number of quadrats of occurrence of species}}{\text{Total number of quadrats studied}}$$

For comparison of different communities, frequency is expressed in terms of percentage values (frequency %) or 'Frequency index'.

$$\text{Percentage Frequency (PF)} = \frac{D}{C} \times 100$$

(where c_i = number of quadrats where species present; C = total number of quadrats studied)

The Relative Fequency (RF) (Phillips, 1959) was calculated as

$$\text{RF} = \frac{\text{No. of quadrats of occurrence of the species}}{\text{No. of quadrats of occurrence of all the species}} \times 100$$

7.1.3. Importance Value Index (IVI)

Curtis and Mc-Intosh (1950) developed a single value index in order to express dominance and ecological success of a species. This index which is called 'Importance Value Index (IVI)', derived from three quantitative parameters of vegetation viz., Relative Frequency (RF), Relative Density (RD), and Relative Basal Area (RBA for trees and shrubs only).

$$\text{IVI} = \text{RF} + \text{RD} + \text{RBA}$$

8. Framework of the report

Since the main objective of this study is the comparison of flora in paddyfields following chemical and organic farming, the result obtained are presented in a systematic manner with a broad category such as Post-harvest and pre-harvest seasons in May and September respectively. Floristic diversity and structure in organic and chemical farming area for two seasons are analysed, presented and compared for better understanding on the vegetation structure. Overall flora is analysed and compared with the results of first phase of the study. In each part, flora common to the area is provided followed by structural and compositional attributes. Density, frequency and other parameters are provided for the most common species in each habitat. Since the paddy field were devoid of arborescent species, quantitative analysis were done only

for herbaceous species which are distributed in random manner. In the report, the plant species are enumerated under alphabetical order based on the valid name. Other scientific details such as synonym/s, family, vernacular name/s, English name/s, botanical description, medicinal properties, etc. are avoided since the study is focused only on the species distribution pattern. As only frequency and density of most common species are required for this study more complicated indices are avoided.

Abbreviations used in the text are Den. - Density, Freq. - Frequency, BA - Basal Area, RD - Relative density, RF- Relative frequency, RBA - Relative Basal Area, IVI - Importance Value Index, RIVI - Relative Importance Value Index.

9.RESULTS

First phase of this project monitored the vegetation structure in entire Padetti micro-watershed area and generated comprehensive information about the vegetal mosaics in diverse habitats. Since paddyfields are continuously subjected to intensive cultivation practices, compared to other habitats vegetal changes may take place within a short duration. So, the second phase of the study exclusively examined the situation prevailed in paddyfields under chemical and organic farming. Moreover, the explored area is habituated with particular agricultural methods of organic and

chemical for a time span of two years, which facilitated the collection of more accurate data about the influence of these two systems of farming. For analyzing seasonal vegetal configuration, data during two seasons such as pre-harvest and post-harvest were collected and processed. Pre-harvest scenarios were assessed after examining the data collected during September, though the season is the post session of second weeding. However, during this season available ones are in full bloom and rest of the weeds is in regeneration stage, so as to get comparatively an explicit data. For assessing the post-harvest scenario, data collected during May, comparatively dry season without any agricultural activity, the woody forms of flora were prevalent. Data were collected from both organic and chemical farms. Comparisons were done for the similar season under chemical and organic farming category. This is compared with the data of first phase for better understanding about the vegetal dynamics occurring in organic and chemical farms for a long duration.

9.1.PRE-HARVEST AND POST-HARVEST CONFIGURATION

In the context of ongoing organic cultivation, paddyfields are assessed for its diversity, productivity and sustainability. For a long period of time, productivity and sustainability is directly proportional to diversity and the



Paddy field in pre harvest stage

later can be easily assessed through vegetation analysis. The influence of farming methods immediately reflects on animal diversity, especially on amphibians, worms, soil microbes, etc. though, the plants respond to the changes in soil but in a slow and steady mode. Among the plants, ephemerals and herbaceous components are more sensitive than other habit groups. So, the changes in soil and environment can be easily recognized through studying the distribution and diversity of herbs and other ephemerals in the area. For collecting vegetal dynamics, diversity and structural data, different time intervals such as pre-harvest season and post-harvest season were studied in detail. Post and pre-harvest configuration in both chemical and organic farming area is systematically discussed in following chapters. Overall floristic diversity is also provided for the better understanding of the diversity of this region, since the area is following organic farming for a period of two years.

9.2.OVERALL FLORISTIC DIVERSITY

Compared to 465 taxa of vascular plants documented from the entire Padetti micro-watershed area during the first phase of the study, 202 are recorded during the second phase from paddyfields and adjacent organic homesteads only. Among the 202 species enumerated from the sample plots, about 30 per cent of species have higher percentage of abundance, density and frequency.

Distribution pattern of the recorded species during the second phase of study has shown that there is a decrease in exotic and broad spectrum floristic elements in the area (Table 1). Two year of organic cultivation yielded higher percentage of indigenous and site specific species. There is a marked variation in vegetal structure of chemical and organic farming area in all the studied seasons.

A view of paddy field and bund with palmyra palm in the background



Table 1. Vascular flora recorded from Padetti during the second phase

No	Species	Family	Distribution
1.	<i>Achyranthes aspera</i> L.	Amaranthaceae	Pantropical
2.	<i>Aerva lanata</i> (L.) Juss. ex Schult.	Amaranthaceae	Tropics & subtropics
3.	<i>Aeschynomene aspera</i> L.	Fabaceae	Indo-Malesia
4.	<i>Ageratum conyzoides</i> L.	Asteraceae	Pantropics
5.	<i>Alloteroopsis cimicina</i> (L.) Stapf	Poaceae	Paleotropics
6.	<i>Alternanthera bettzickiana</i> (Regel) Voss	Amaranthaceae	Tropical America
7.	<i>Alternanthera paronychioides</i> A. St. Hill	Amaranthaceae	Tropical Asia & America
8.	<i>Alternanthera sessilis</i> (L.) R. Br. ex. DC.	Amaranthaceae	Pantropics
9.	<i>Alysicarpus vaginalis</i> (L.) DC.	Fabaceae	Paleotropics
10.	<i>Amaranthus tricolor</i> L.	Amaranthaceae	Tropics
11.	<i>Ammannia baccifera</i> L.	Lythraceae	Tropics
12.	<i>Anamirta cocculus</i> (L.) Wight & Arn.	Menispermaceae	Indo-Malesia
13.	<i>Anisochilus carnosus</i> (L. f.) Wail. ex Benth.	Lamiaceae	South India, Sri Lanka & Myanmar
14.	<i>Areca catechu</i> L.	Arecaceae	Cultivated
15.	<i>Aristolochia indica</i> L.	Aristolochiaceae	Indo-Malesia
16.	<i>Artocarpus heterophyllus</i> Lam.	Moraceae	South India. Cultivated in Tropics
17.	<i>Axonopus compressus</i> (Sw.) P. Beauv.	Poaceae	Tropics & subtropics
18.	<i>Azadirachta indica</i> A. Juss.	Meliaceae	Indo-Malesia
19.	<i>Barleria prionitis</i> L.	Acanthaceae	Tropical Asia & Africa
20.	<i>Bidens pilosa</i> L. var. minor (Blume) Sherff	Asteraceae	Pantropics
21.	<i>Biophytum reinwardtii</i> (Zucc.) Klotzsch.	Oxalidaceae	Indo-Malesia & China
22.	<i>Blumea belangeriana</i> DC.	Asteraceae	India & Sri Lanka
23.	<i>Blumea oxyodonta</i> DC.	Asteraceae	Indo-Malesia
24.	<i>Borassus flabellifer</i> L.	Arecaceae	Palaetropics
25.	<i>Bougainvillea spectabilis</i> Willd.	Nyctaginaceae	Native of Brazil. Cultivated
26.	<i>Brachiaria miliiformis</i> (J. Presl ex C. Presl) A. Chase	Poaceae	Indo-Malesia
27.	<i>Brachiaria remota</i> (Retz.) Haines	Poaceae	India & Sri Lanka
28.	<i>Briedelia retusa</i> (L.) A. Juss.	Euphorbiaceae	Indo-Malesia
29.	<i>Bulbostylis barbata</i> (Rottb.) Kunth ex Clarke	Cyperaceae	Paleotropics
30.	<i>Caesalpinia mimosoides</i> Lam.	Caesalpiniaceae	Indo-Malesia
31.	<i>Cajanus cajan</i> (L.) Millsp.	Fabaceae	Cosmopolitan. Cultivated
32.	<i>Canna indica</i> L.	Cannaceae	Indo-Malesia. Cultivated
33.	<i>Capsicum annuum</i> L.	Solanaceae	West Indies. Cultivated
34.	<i>Capsicum frutescens</i> L.	Solanaceae	Tropical America. Cultivated
35.	<i>Cardiospermum halicacabum</i> L.	Sapindaceae	Pantropics
36.	<i>Centella asiatica</i> (L.) Urban	Apiaceae	Tropical Asia & Africa
37.	<i>Centrosema molle</i> Benth.	Fabaceae	Cosmopolitan
38.	<i>Ceratopteris thalictroides</i> (L.) Brongn.	Ceratopteridaceae	Tropics
39.	<i>Chamaesyce hirta</i> (L.) Millsp.	Euphorbiaceae	Native of Tropical America now Pantropical
40.	<i>Chamaesyce rosea</i> (Retz.) Webster	Euphorbiaceae	South Asia
41.	<i>Chromolaena odorata</i> (L.) King & Robins.	Asteraceae	Naturalised in Tropics
42.	<i>Chrysopogon aciculatus</i> (Retz.) Trin.	Poaceae	Tropical Asia & Australia
43.	<i>Cinnamomum verum</i> Presl	Lauraceae	South West India & Sri Lanka

44.	<i>Cissampelos pareira</i> L. var. <i>hirsuta</i> (Ham. ex DC.) Forman	Menispermaceae	Indo-Malesia
45.	<i>Citrus medica</i> L.	Rutaceae	India.Cultivated
46.	<i>Cleistanthus collinus</i> (Roxb.) Benth. ex Hook.f.	Euphorbiaceae	India & Sri Lanka
47.	<i>Clerodendrum infortunatum</i> L.	Verbenaceae	Indo-Malesia
48.	<i>Cocos nucifera</i> L.	Areaceae	Cultivated through out tropics
49.	<i>Coldenia procumbens</i> L.	Boraginaceae	Pantropics
50.	<i>Commelina benghalensis</i> L.	Commelinaceae	Paleotropics
51.	<i>Commelina diffusa</i> Burm. f.	Commelinaceae	Pantropics
52.	<i>Corchorus aestuans</i> L.	Tiliaceae	Pantropics
53.	<i>Crossandra infundibuliformis</i> (L.) Nees	Acanthaceae	Cultivated
54.	<i>Croton bonplandianus</i> Baill.	Euphorbiaceae	Paleotropics
55.	<i>Cryptolepis buchananii</i> Roem. & Schult.	Asclepiadaceae	Peninsular India & Sri Lanka
56.	<i>Cyanotis axillaris</i> (L.) D. Don	Commelinaceae	Indo-Malesia
57.	<i>Cyathula prostrata</i> (L.) Blume	Amaranthaceae	Pantropics
58.	<i>Cyclea peltata</i> (Lam.) Hook. f. & Thoms.	Menispermaceae	India & Sri Lanka
59.	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Tropics and warm temperate regions
60.	<i>Cyperus castaneus</i> Willd.	Cyperaceae	Indo-Malesia to Northern Australia
61.	<i>Cyperus compactus</i> Retz.	Cyperaceae	South and South East Asia
62.	<i>Cyperus compressus</i> L.	Cyperaceae	Pantropics
63.	<i>Cyperus cyperinus</i> (Retz.) Sur.	Cyperaceae	Tropics & subtropics
64.	<i>Cyperus difformis</i> L.	Cyperaceae	Tropics & Subtropics
65.	<i>Cyperus digitatus</i> Roxb.	Cyperaceae	Pantropics
66.	<i>Cyperus distans</i> L. f.	Cyperaceae	Pantropics
67.	<i>Cyperus exaltatus</i> Retz.	Cyperaceae	Pantropics
68.	<i>Cyperus haspan</i> L.	Cyperaceae	Pantropics
69.	<i>Cyperus iria</i> L.	Cyperaceae	Tropical Asia & East Africa
70.	<i>Dalbergia latifolia</i> Roxb.	Fabaceae	Indo-Malesia
71.	<i>Datura metel</i> L.	Solanaceae	Paleotropics
72.	<i>Desmodium triflorum</i> (L.) DC.	Fabaceae	Indo-Malesia and Australia
73.	<i>Desmodium triquetrum</i> (L.) DC.	Fabaceae	Indo-Malesia to Pacific Islands
74.	<i>Digitaria ciliaris</i> (Retz.) Koeler	Poaceae	Paleotropics
75.	<i>Dipteracanthus prostratus</i> (Poir.) Nees	Acanthaceae	India
76.	<i>Dopatrium junceum</i> (Roxb.) Buch.-Ham. ex Benth.	Scrophulariaceae	Eastern tropics
77.	<i>Duranta erecta</i> L.	Verbenaceae	Cosmopolitan
78.	<i>Echinochloa colonum</i> (L.) Link	Poaceae	Tropical Asia & Africa
79.	<i>Eclipta prostrata</i> (L.) L.	Asteraceae	Pantropics
80.	<i>Eleusine indica</i> (L.) Gaertn.	Poaceae	Pantropics
81.	<i>Emilia sonchifolia</i> (L.) DC.	Asteraceae	Tropical & Subtropical Africa and Asia
82.	<i>Eragrostis japonica</i> (Thunb.) Trin.	Poaceae	Pantropics
83.	<i>Eragrostis tenella</i> (L.) P. Beauv. ex Roem. & Schult.	Poaceae	Paleotropics
84.	<i>Eragrostis unioloides</i> (Retz.) Nees ex Steud.	Poaceae	South East Asia,India & Africa
85.	<i>Eragrostis viscosa</i> (Retz.) Trin.	Poaceae	Pantropics
86.	<i>Eriocaulon sexangulare</i> L.	Eriocaulaceae	Indo-Malesia
87.	<i>Eriocaulon thwaitesii</i> Koernicke	Eriocaulaceae	Peninsular India & Sri Lanka
88.	<i>Ficus hispida</i> L. f.	Moraceae	Indo-Malesia to Australia
89.	<i>Fimbristylis aestivalis</i> Vahl	Cyperaceae	Asia & Australia

90.	<i>Fimbristylis argentea</i> (Rottb.) Vahl	Cyperaceae	South and south east Asia
91.	<i>Fimbristylis dichotoma</i> (L.) Vahl	Cyperaceae	Pantropics
92.	<i>Fimbristylis microcarya</i> Muller	Cyperaceae	India & East Asia
93.	<i>Fimbristylis narayani</i> C.E.C. Fisch.	Cyperaceae	South India
94.	<i>Fimbristylis tetragona</i> R. Br.	Cyperaceae	Tropics
95.	<i>Glinus oppositifolius</i> (L.) A. DC.	Molluginaceae	Pantropics
96.	<i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp.	Fabaceae	Native of South America, Cultivated
97.	<i>Glycosmis pentaphylla</i> (Retz.) DC.	Rutaceae	Indo-Malesia
98.	<i>Hemidesmus indicus</i> (L.) R. Br.	Periplocaceae	India & Sri Lanka
99.	<i>Holarthra pubescens</i> (Buch.-Ham.) Wall. ex G. Don	Apocynaceae	Indo-Malesia
100.	<i>Hydrolea zeylanica</i> (L.) Vahl	Hydroleaceae	Pantropics
101.	<i>Hygrophila schullii</i> (Buch.-Ham.) M. R. & S. M. Almeida	Acanthaceae	India, Myanmar & Indo-China
102.	<i>Hygrophila ringens</i> (L.) Steud.	Acanthaceae	Indo-Malesia
103.	<i>Hyptis capitata</i> Jacq.	Lamiaceae	Tropical America & Asia
104.	<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	Pantropics
105.	<i>Ichnocarpus frutescens</i> (L.) R. Br.	Apocynaceae	Indo-Malesia & Australia
106.	<i>Ipomoea marginata</i> (Desr.) Verdc.	Convolvulaceae	Paleotropics
107.	<i>Ipomoea asarifolia</i> (Desr.) Roem. & Schult.	Convolvulaceae	Peninsular India & Sri Lanka
108.	<i>Ipomoea deccana</i> Austin	Convolvulaceae	India & Sri Lanka
109.	<i>Ipomoea obscura</i> (L.) Ker-Gawl.	Convolvulaceae	Tropical Asia & Africa
110.	<i>Isachne globosa</i> (Thunb.) O. Ktze.	Poaceae	Tropical Asia
111.	<i>Isachne miliacea</i> Roth	Poaceae	India, China and South East Asia
112.	<i>Ischaemum indicum</i> (Houtt.) Merr.	Poaceae	Peninsular India & South east Asia
113.	<i>Jasminum flexile</i> Vahl	Oleaceae	Peninsular India & Sri Lanka
114.	<i>Jasminum multiflorum</i> (Burm. f.) Andr.	Oleaceae	Indo-Malesia & China
115.	<i>Justicia gendarussa</i> Burm. f.	Acanthaceae	Tropical Africa & Asia
116.	<i>Justicia japonica</i> Thunb.	Acanthaceae	Indo-Malesia & East Africa
117.	<i>Justicia trinervia</i> Vahl	Acanthaceae	Southern Western Ghats
118.	<i>Kyllinga brevifolia</i> Rottb.	Cyperaceae	Pantropics
119.	<i>Kyllinga nemoralis</i> (J. R & G. Forst.) Dandy ex Hutch. & Dalz.	Cyperaceae	Pantropics
120.	<i>Lantana camara</i> L.	Verbenaceae	Naturalised in the tropics
121.	<i>Limnophila repens</i> (Benth.) Benth.	Scrophulariaceae	Tropical Asia
122.	<i>Lindernia anagallis</i> (Burm. f.) Pennell	Scrophulariaceae	Indo-Malesia
123.	<i>Lindernia antipoda</i> (L.) Alston	Scrophulariaceae	Tropical & subtropical Asia and Australia
124.	<i>Ludwigia hyssopifolia</i> (G. Don) Exell	Onagraceae	Pantropics
125.	<i>Ludwigia octovalvis</i> (Jacq.) Raven ssp. sessiliflora (Michx.) Raven	Onagraceae	Pantropics
126.	<i>Lycopersicon esculentum</i> Mill.	Solanaceae	East and South America & Mexico. Cultivated
127.	<i>Mangifera indica</i> L.	Anacardiaceae	Indo-malesia. Cultivated
128.	<i>Marsilea minuta</i> L.	Marsileaceae	Tropics & Subtropics
129.	<i>Melochia corchorifolia</i> L.	Sterculiaceae	Pantropics
130.	<i>Merremia turpethum</i> (L.) Shah & Bhat	Convolvulaceae	Paleotropics
131.	<i>Merremia umbellata</i> (L.) Hall. f.	Convolvulaceae	Pantropics

132.	<i>Merremia vitifolia</i> (Burm. f.) Hall. f.	Convolvulaceae	Indo-China & China
133.	<i>Microstachys chamaelea</i> (L.) Muell.-Arg.	Euphorbiaceae	Indo-Malesia to Australia
134.	<i>Mikania micrantha</i> Kunth	Asteraceae	Pantropics
135.	<i>Milium tomentosum</i> (Roxb.) Finet & Gagnep.	Annonaceae	India, Nepal & Sri Lanka
136.	<i>Mimosa pudica</i> L.	Mimosaceae	Native of S.America now Pantropical
137.	<i>Mollugo pentaphylla</i> L.	Molluginaceae	Pantropics
138.	<i>Momordica charantia</i> L.	Cucurbitaceae	Paleotropics.Cultivated
139.	<i>Monochoria vaginalis</i> (Burm. f.) Presl	Pontederiaceae	Indo-Malesia
140.	<i>Morinda pubescens</i> J. E. Smith	Rubiaceae	Indo-Malesia
141.	<i>Moringa pterygosperma</i> Gaertn.	Moringaceae	Tropics- cultivated
142.	<i>Mukia maderaspatana</i> (L.) Roem.	Cucurbitaceae	Paleotropics
143.	<i>Murdannia spirata</i> (L.) Brueck.	Commelinaceae	Indo-Malesia
144.	<i>Murraya koenigii</i> (L.) Spreng.	Rutaceae	Indo-malesia and China.Cultivated
145.	<i>Musa x paradisiaca</i> L.	Musaceae	South Asia.Cultivated
146.	<i>Naregamia alata</i> Wight & Arn.	Meliaceae	Peninsular India
147.	<i>Ocimum gratissimum</i> L.	Lamiaceae	Pantropical
148.	<i>Ocimum tenuiflorum</i> L.	Lamiaceae	Palaeotropics
149.	<i>Oldenlandia corymbosa</i> L.	Rubiaceae	Pantropics
150.	<i>Oplismenus burmannii</i> (Retz.) P. Beauv.	Poaceae	Pantropics
151.	<i>Oplismenus compositus</i> (L.) P. Beauv.	Poaceae	Pantropics
152.	<i>Oryza sativa</i> L.	Poaceae	Cultivated
153.	<i>Panicum repens</i> L.	Poaceae	Tropics & subtropics
154.	<i>Paspalidium flavidum</i> (Retz.) A. Camus	Poaceae	Tropical Asia
155.	<i>Paspalum conjugatum</i> Berg.	Poaceae	Pantropics
156.	<i>Paspalum scrobiculatum</i> L.	Poaceae	India and Pakistan
157.	<i>Passiflora foetida</i> L.	Passifloraceae	Native of Tropical America
158.	<i>Pennisetum hohenackeri</i> Hochst. ex Steud.	Poaceae	Tropical Africa & Asia
159.	<i>Pennisetum polystachyon</i> (L.) Schult.	Poaceae	Paleotropics
160.	<i>Phaulopsis imbricata</i> (Forssk.) Sweet.	Acanthaceae	Indo-Malesia, & Africa
161.	<i>Phyla nodiflora</i> (L.) Greene	Verbenaceae	Tropics & subtropics
162.	<i>Phyllanthus amarus</i> Schum. & Thonn.	Euphorbiaceae	Tropics
163.	<i>Phyllanthus emblica</i> L.	Euphorbiaceae	Tropics
164.	<i>Phyllanthus reticulatus</i> Poir.	Euphorbiaceae	Paleotropics
165.	<i>Phyllanthus urinaria</i> L.	Euphorbiaceae	Native of Tropical East Asia.Now Circumtropical
166.	<i>Physalis angulata</i> L.	Solanaceae	Tropical Asia, Africa & Australia
167.	<i>Piper nigrum</i> L.	Piperaceae	Peninsular India & Sri Lanka.Cultivated
168.	<i>Pongamia pinnata</i> (L.) Pierre	Fabaceae	Indo-Malesia
169.	<i>Pseudanthistiria umbellata</i> (Hack.) Hook. f.	Poaceae	Peninsular India & Sri Lanka
170.	<i>Psidium guajava</i> L.	Myrtaceae	Originally from Tropical America. Cultivated
171.	<i>Pycnus polystachyos</i> (Rottb.) P. Beauv.	Cyperaceae	Tropics & subtropics
172.	<i>Rotala indica</i> (Willd.) Koehne	Lythraceae	Tropical Asia
173.	<i>Sacciolepis indica</i> (L.) A. Chase	Poaceae	Tropical Asia & Australia
174.	<i>Sacciolepis interrupta</i> (Willd.) Stapf	Poaceae	Tropical South east Asia and Africa
175.	<i>Sauropus quadrangularis</i> (Willd.) Muell.-Arg.	Euphorbiaceae	Indo-Malesia

176.	<i>Schoenoplectiella lateriflora</i> (Gmel.) Lye	Cyperaceae	Paleotropics
177.	<i>Scoperia dulcis</i> L.	Scrophulariaceae	Tropical America, now pantropical
178.	<i>Senna tora</i> (L.) Roxb.	Caesalpiniaceae	Native of South America
179.	<i>Setaria intermedia</i> Roem. & Schult.	Poaceae	India, Myanmar & Sri Lanka
180.	<i>Setaria pumila</i> (Poir.) Roem. & Schult.	Poaceae	Paleotropics
181.	<i>Sida acuta</i> Burm. f.	Malvaceae	Pantropics
182.	<i>Sida ainifolia</i> L.	Malvaceae	Indo-Malesia
183.	<i>Sida cordata</i> (Burm. f.) Borss.	Malvaceae	Pantropics
184.	<i>Sida cordifolia</i> L.	Malvaceae	Pantropics
185.	<i>Solanum melongena</i> L.	Solanaceae	Paleotropics, Cultivated
186.	<i>Spermocoe articularis</i> L. f.	Rubiaceae	Tropical Asia & Africa
187.	<i>Spermocoe hispida</i> L.	Rubiaceae	Peninsular India
188.	<i>Sphaeranthus africanus</i> L.	Asteraceae	Indo-Malesia, & Australia
189.	<i>Sphaeranthus indicus</i> L.	Asteraceae	Indo-Malesia, Australia & Africa
190.	<i>Strychnos nux-vomica</i> L.	Loganiaceae	Indo-Malesia
191.	<i>Synedrella nodiflora</i> (L.) Gaertn.	Asteraceae	Tropics
192.	<i>Tamarindus indica</i> L.	Caesalpiniaceae	Native of Tropical Africa. Cultivated
193.	<i>Tectona grandis</i> L. f.	Verbenaceae	South & South East Asia
194.	<i>Themeda triandra</i> Forssk.	Poaceae	Paleotropics
195.	<i>Thevetia peruviana</i> (Pers.) Merr.	Apocynaceae	Native of Tropical America, now Pantropical
196.	<i>Triumfetta rhomboidea</i> Jacq.	Tiliaceae	Pantropics
197.	<i>Urena lobata</i> L. ssp. <i>sinuata</i> (L.) Borss.	Malvaceae	Pantropics
198.	<i>Utricularia graminifolia</i> Vahl.	Lentibulariaceae	India & Sri Lanka
199.	<i>Vernonia cinerea</i> (L.) Less.	Asteraceae	Pantropics
200.	<i>Vigna radiata</i> (L.) Wilczek	Fabaceae	Paleotropics
201.	<i>Xenostegia tridentata</i> (L.) Austin & Staples	Convolvulaceae	Paleotropics
202.	<i>Xylia xylocarpa</i> (Roxb.) Taub.	Mimosaceae	Indo-Malesia

9.2.1. PRE-HARVEST PERIOD - SEPTEMBER

9.2.1.1. Overall floristic diversity

A total of 91 species were recorded during pre-harvest period, September (Table 2). It includes species recorded from bunds and paddyfields under organic and chemical farming practices. Since this season is the post session of second weeding and just before the harvesting stage of paddy, weed density is comparatively high. Data shows that species diversity is higher in bund during this period. Most of the members are grasses and sedges. Climbers and other erect herbaceous members are common along the bunds during this period.



Pre harvest period - biodiversity

Table 2. List of species recorded during pre-harvest period.

No	Species	Habit
1.	<i>Achyranthes aspera</i>	Prostrate herb
2.	<i>Ageratum conyzoides</i>	Erect herb
3.	<i>Alloteropsis cimicina</i>	Grass
4.	<i>Alternanthera paronychioides</i>	Prostrate herb
5.	<i>Alternanthera sessilis</i>	Prostrate herb
6.	<i>Ammannia baccifera</i>	Erect herb
7.	<i>Aristolochia indica</i>	Climbing herb
8.	<i>Axonopus compressus</i>	Grass
9.	<i>Brachiaria miliiformis</i>	Grass
10.	<i>Bulbostylis barbata</i>	Sedge
11.	<i>Centrosema molle</i>	Climbing herb
12.	<i>Ceratopteris thalictroides</i>	Erect herb
13.	<i>Chromolaena odorata</i>	Gregarious shrub
14.	<i>Chrysopogon aciculatus</i>	Grass
15.	<i>Clerodendrum infortunatum</i>	Shrub
16.	<i>Commelina diffusa</i>	Erect herb
17.	<i>Corchorus aestuans</i>	Erect herb
18.	<i>Cyanotis axillaris</i>	Prostrate herb
19.	<i>Cynodon dactylon</i>	Grass
20.	<i>Cyperus castaneus</i>	Sedge
21.	<i>Cyperus compactus</i>	Sedge
22.	<i>Cyperus compressus</i>	Sedge
23.	<i>Cyperus distans</i>	Sedge
24.	<i>Cyperus haspan</i>	Sedge
25.	<i>Cyperus iria</i>	Sedge
26.	<i>Datura metel</i>	Subshrub
27.	<i>Desmodium triflorum</i>	Prostrate herb
28.	<i>Desmodium triquetrum</i>	Woody herb
29.	<i>Digitaria ciliaris</i>	Grass
30.	<i>Dopatrium junceum</i>	Erect herb
31.	<i>Eclipta prostrata</i>	Erect herb
32.	<i>Eleusine indica</i>	Grass
33.	<i>Emilia sonchifolia</i>	Erect herb
34.	<i>Eragrostis japonica</i>	Grass
35.	<i>Eragrostis tenella</i>	Grass
36.	<i>Eragrostis unioloides</i>	Grass
37.	<i>Eriocaulon sexangulare</i>	Sedge
38.	<i>Fimbristylis aestivalis</i>	Sedge
39.	<i>Fimbristylis dichotoma</i>	Sedge
40.	<i>Fimbristylis microcarya</i>	Sedge
41.	<i>Fimbristylis narayani</i>	Sedge
42.	<i>Fimbristylis tetragonolobus</i>	Sedge
43.	<i>Hygrophila ringens</i>	Erect herb
44.	<i>Hygrophila schulli</i>	Erect herb

45.	<i>Hyptis suaveolens</i>	Erect herb
46.	<i>Ipomoea asarifolia</i>	Climbing herb
47.	<i>Ipomoea obscura</i>	Climbing herb
48.	<i>Isachne globosa</i>	Grass
49.	<i>Isachne miliacea</i>	Grass
50.	<i>Ischaemum indicum</i>	Grass
51.	<i>Justicia japonica</i>	Erect herb
52.	<i>Kyllinga brevifolia</i>	Sedge
53.	<i>Kyllinga nemoralis</i>	Sedge
54.	<i>Limnophila repens</i>	Erect herb
55.	<i>Lindernia antipoda</i>	Prostrate herb
56.	<i>Ludwigia hyssopifolia</i>	Erect herb
57.	<i>Ludwigia octovalvis</i>	Erect herb
58.	<i>Marselia minuta</i>	Erect herb
59.	<i>Melochia carchorifolia</i>	Erect herb
60.	<i>Merremia turpethum</i>	Climbing herb
61.	<i>Merremia umbellata</i>	Climbing herb
62.	<i>Microstachys chamaelea</i>	Erect herb
63.	<i>Mimosa pudica</i>	Prostrate herb
64.	<i>Murdennia spirata</i>	Erect herb
65.	<i>Oldenlandia corymbosa</i>	Prostrate herb
66.	<i>Oryza sativa</i>	Grass
67.	<i>Panicum repens</i>	Grass
68.	<i>Paspalidium flavidum</i>	Grass
69.	<i>Paspalum scrobiculatum</i>	Grass
70.	<i>Passiflora foetida</i>	Climbing herb
71.	<i>Pennisetum hohenackeri</i>	Grass
72.	<i>Pennisetum polystachyon</i>	Grass
73.	<i>Phyllanthus urinaria</i>	Erect herb
74.	<i>Physalis angulata</i>	Erect herb
75.	<i>Pseudanthistiria umbellata</i>	Grass
76.	<i>Pycneus polystachyos</i>	Sedge
77.	<i>Sacciolepis indica</i>	Grass
78.	<i>Sacciolepis interrupta</i>	Grass
79.	<i>Sauropus quadrangularis</i>	Subshrub
80.	<i>Schoenoplectiella lateriflora</i>	Sedge
81.	<i>Scoparia dulcis</i>	Erect herb
82.	<i>Setaria intermedia</i>	Grass
83.	<i>Setaria pumila</i>	Grass
84.	<i>Spermacoce articularis</i>	Erect herb
85.	<i>Spermacoce hispida</i>	Erect herb
86.	<i>Sphaeranthus indicus</i>	Erect herb
87.	<i>Synedrella nodiflora</i>	Erect herb
88.	<i>Urena lobata</i>	Erect herb
89.	<i>Vernonia cinerea</i>	Erect herb
90.	<i>Vigna radiata</i>	Climbing herb
91.	<i>Xenostegia tridentata</i>	Climbing herb

9.2.1.2 ORGANIC FARMING

9.2.1.2.1 Over all diversity

A total of 63 taxa were recorded from the organic farming area (Table 3). Exotics, invasive alien weeds and broad spectrum elements are comparatively low. The herbaceous flora, characteristic of deciduous forests are well represented in the area. Site specific species characteristic of tropical or south Indian marshes are also common in the organic farming area. One of the important peculiarities observed in the flora of organic farming area in Padetti is the rich medicinal plants diversity.



Table 3. List of species recorded from the organic farming area

No	Species	Remarks
1.	<i>Achyranthes aspera</i>	Medicinal
2.	<i>Ageratum conyzoides</i>	
3.	<i>Alloterosis cimicina</i>	
4.	<i>Alternanthera paronychioides</i>	
5.	<i>Aristolochia indica</i>	Medicinal
6.	<i>Axonopus compressus</i>	
7.	<i>Bulbostylis barbata</i>	
8.	<i>Centrosema molle</i>	Medicinal
9.	<i>Ceratopteris thalictroides</i>	Medicinal
10.	<i>Chromolaena odorata</i>	Medicinal
11.	<i>Clerodendrum infortunatum</i>	Medicinal
12.	<i>Commelina diffusa</i>	
13.	<i>Corchorus aestuans</i>	
14.	<i>Cyanotis axillaris</i>	
15.	<i>Cynodon dactylon</i>	Medicinal
16.	<i>Cyperus compressus</i>	
17.	<i>Cyperus distans</i>	
18.	<i>Cyperus haspan</i>	
19.	<i>Digitaria ciliaris</i>	
20.	<i>Dopatrium junceum</i>	
21.	<i>Eclipta prostrata</i>	Medicinal
22.	<i>Eleusine indica</i>	
23.	<i>Emilia sonchifolia</i>	Medicinal
24.	<i>Eragrostis japonica</i>	
25.	<i>Eragrostis unioloides</i>	
26.	<i>Eriocaulon sexangulare</i>	
27.	<i>Fimbristylis microcarya</i>	
28.	<i>Fimbristylis narayanii</i>	
29.	<i>Fimbristylis tetragonolobus</i>	
30.	<i>Hygrophila ringens</i>	Medicinal
31.	<i>Hygrophila schulli</i>	Medicinal

32.	<i>Hyptis suaveolens</i>	Medicinal
33.	<i>Ipomoea asarifolia</i>	Medicinal
34.	<i>Ipomoea obscura</i>	Medicinal
35.	<i>Isachne globosa</i>	
36.	<i>Isachne miliacea</i>	
37.	<i>Ischaemum indicum</i>	
38.	<i>Justicia japonica</i>	
39.	<i>Kyllinga brevifolia</i>	
40.	<i>Ludwigia hyssopifolia</i>	
41.	<i>Ludwigia octovalvis</i>	
42.	<i>Marsilea minuta</i>	
43.	<i>Melochia corchorifolia</i>	
44.	<i>Merremia turpethum</i>	Medicinal
45.	<i>Merremia umbellata</i>	
46.	<i>Mimosa pudica</i>	Medicinal
47.	<i>Dryza sativa</i>	
48.	<i>Panicum repens</i>	
49.	<i>Paspalum scrobiculatum</i>	
50.	<i>Pennisetum hohenackerii</i>	Medicinal
51.	<i>Pennisetum polystachyon</i>	
52.	<i>Phyllanthus urinaria</i>	Medicinal
53.	<i>Sacciolepis indica</i>	
54.	<i>Sacciolepis interrupta</i>	
55.	<i>Scoparia dulcis</i>	Medicinal
56.	<i>Setaria intermedia</i>	Medicinal
57.	<i>Setaria pumila</i>	Medicinal
58.	<i>Spermacoce articularis</i>	Medicinal
59.	<i>Spermacoce hispida</i>	
60.	<i>Sphaeranthus indicus</i>	Medicinal
61.	<i>Urena lobata</i>	Medicinal
62.	<i>Vernonia cinerea</i>	Medicinal
63.	<i>Xenostegia tridentata</i>	Medicina

9.2.1.2.2. Floristic diversity of paddy field

A total of 29 species were recorded from the paddyfields of organic farming area. The flora is dominated by sedges and grasses. Seedlings of trees were also recorded. Water ferns such as *Marselia minuta*, *Ceratopteris thalictroides*, etc. are well represented in the paddyfield flora. The species growing gregariously in the paddy field have some specialised tissue in their basal portion or root. This group of plants locally known as Pollakkala (Polla means a vacuole, Kala means weed). Large aerenchymatous tissue in the roots or basal portion is the peculiarity of these species. *Sacciolepis interrupta*, *Cyanotis axillaris*, *Ludwigia octovalvis*, *Ludwigia*



Native paddy field

hyssopifolia, etc. are few gregarious vacuolated weeds in the paddy field. Some habitat specific species, which are found only in paddyfields and associated marshes, are recorded from the area.

9.2.1.2.3. Structural and compositional attributes of flora in paddyfield

Among the 29 species recorded from the sample plots of paddyfields, erect ephemerals dominated over grasses or sedges (Table 4). The species *Ludwigia octovalvis* has the highest density followed by *Ludwigia hyssopifolia*, *Fimbristylis microcarya*, *Cyperus compressus*, *Dopatrium junceum*, *Isachne globosa* and *Cyanotis axillaris*. A cyperacean member *Fimbristylis microcarya* has the highest frequency followed by *Ludwigia hyssopifolia*, *Isachne miliacea*, *Isachne globosa*, *Cyperus compressus* and *Dopatrium junceum*.

Species such as *Ludwigia hyssopifolia*, *Fimbristylis microcarya*, *Ludwigia octovalvis*, *Isachne miliacea*, *Isachne globosa*, *Cyperus compressus* and *Dopatrium junceum* showing the highest IVI values of 10 or more. Among the 29 species recorded from the area only five species have lowest IVI value of less than two.



Common weed in paddy field

Table 4. Structural and compositional attributes of Paddyfields in organic farming area (Values in ha⁻¹).

No.	Species	den	freq	rd	rf	ivi	rivi
1	<i>Ageratum conyzoides</i>	3000	10	0.26	0.88	1.14	0.57
2	<i>Bulbostylis barbata</i>	48000	50	4.12	4.42	8.54	4.27
3	<i>Ceratopteris thalictroides</i>	8000	20	0.69	1.77	2.46	1.23
4	<i>Corchorus aestuans</i>	4000	20	0.34	1.77	2.11	1.06
5	<i>Cyanotis axillaris</i>	52000	40	4.47	3.54	8.01	4.01
6	<i>Cyperus compressus</i>	62000	60	5.33	5.31	10.64	5.32
7	<i>Cyperus haspan</i>	38000	40	3.26	3.54	6.8	3.4
8	<i>Dopatrium junceum</i>	59000	60	5.07	5.31	10.38	5.19
9	<i>Eclipta prostrata</i>	14000	20	1.2	1.77	2.97	1.49
10	<i>Eriocaulon sexangulare</i>	47000	20	4.04	1.77	5.81	2.91
11	<i>Fimbristylis microcarya</i>	88000	100	7.56	8.85	16.41	8.21
12	<i>Fimbristylis narayanii</i>	9000	10	0.77	0.88	1.65	0.83
13	<i>Fimbristylis tetragonolobus</i>	4000	10	0.34	0.88	1.22	0.61
14	<i>Hygrophila ringens</i>	16000	40	1.37	3.54	4.91	2.46
15	<i>Hygrophila schullii</i>	4000	20	0.34	1.77	2.11	1.06
16	<i>Ipomoea asarifolia</i>	2000	10	0.17	0.88	1.05	0.53
17	<i>Isachne globosa</i>	52000	70	4.47	6.19	10.66	5.33
18	<i>Isachne miliacea</i>	45000	80	3.87	7.08	10.95	5.48

19	<i>Ludwigia octovalvis</i>	164000	20	14.09	1.77	15.86	7.93
20	<i>Ludwigia hyssopifolia</i>	136000	80	11.68	7.08	18.76	9.38
21	<i>Marsilea minuta</i>	12000	20	1.03	1.77	2.8	1.4
22	<i>Melochia corchorifolia</i>	8000	40	0.69	3.54	4.23	2.12
23	<i>Oryza sativa</i>	206000	100	17.7	8.85	26.55	13.28
24	<i>Paspalum scrobiculata</i>	4000	10	0.34	0.88	1.22	0.61
25	<i>Sacciolepis interrupta</i>	38000	50	3.26	4.42	7.68	3.84
26	<i>Setaria intermedia</i>	18000	30	1.55	2.65	4.2	2.1
27	<i>Sphaeranthus indicus</i>	6000	20	0.52	1.77	2.29	1.15
28	<i>Urena lobata</i>	7000	40	0.6	3.54	4.14	2.07
29	<i>Vernonia cinerea</i>	10000	40	0.86	3.54	4.4	2.2
	TOTAL	1164000	1130	100	100	200	100

9.2.1.2.4 Floristic Diversity of bunds

Flora in the bunds of paddyfields undergoes various 'structural and compositional changes' related to season, weeding, chemical applications, etc. The analysis of the flora in different season and weeding time showed the variation in diversity, density and frequency. Some erect woody species such as *Sphaeranthus indicus*, *Hygrophila ringens*, *Ludwigia hyssopifolia*, etc. and climbers such as *Xenostegia tridentata*, *Ipomoea asarifolia*, etc. are common in dry season. Its intensity in wet season is low compared to other herbaceous flora. Some grasses such as *Panicum repens*, *Pennisetum polystachyon*, etc. are perennial and seen in almost all the season, except in extreme dry summer, where perenating by subterranean rhizome. On the availability of water the grasses and sedges gradually turns alive and spread over the area. Some gregarious weed grows with high density irrespective of season, but water availability. Small scale vegetable or gram cultivation, planting of coconut and other trees, weed dumping during the weeding time in paddyfields also affect the diversity.

9.2.1.2.5 Structural and compositional attributes of flora in Bunds of paddy field

Among the 48 species recorded from bunds *Ischaemum indicum* has the highest density. It is followed by *Digitaria ciliaris*, *Axonopus compressus*, *Spermacoce articularis*, *Pennisetum polystachyon*, *Paspalum scrobiculatum*, *Panicum repens*, *Cyperus distans* and *Commelina diffusa*. Grasses are dominating with higher density classes. Most gregarious weed in the paddy fields of Padetti such as *Sacciolepis interrupta* and



Cyanotis axillaris are also seen in bunds with high density and frequency (Table 5). A grass *Ischaemum indicum* has the highest frequency followed by *Digitaria ciliaris*, *Pennisetum polystachyon* and *Paspalum scrobiculatum* and *Panicum repens*. An invasive alien weed *Chromolaena odorata* has high frequency.

A grass, *Ischaemum indicum* has the highest IVI value followed by *Digitaria ciliaris*, *Axonopus compressus* and *Pennisetum polystachyon*, these species contributing more than 25 percentages of total IVI values. Among the 48 species recorded from the area all the species have IVI higher than one.



Table 5. Structural and compositional attributes of bunds in organic farming area (Values in ha⁻¹).

No	Species	den	freq	rd	rf	ivi	rivi
1	<i>Achyranthes aspera</i>	2000	10	0.25	0.89	1.14	0.57
2	<i>Alloterospis cimicina</i>	14000	10	1.78	0.89	2.67	1.34
3	<i>Alternanthera paronychioides</i>	11000	20	1.4	1.79	3.19	1.6
4	<i>Aristolochia indica</i>	3000	30	0.38	2.68	3.06	1.53
5	<i>Axonopus compressus</i>	39000	30	4.97	2.68	7.65	3.83
6	<i>Centrosema molle</i>	2000	10	0.25	0.89	1.14	0.57
7	<i>Chromolaena odorata</i>	17000	50	2.17	4.46	6.63	3.32
8	<i>Clerodendrum infortunatum</i>	1000	10	0.13	0.89	1.02	0.51
9	<i>Commelina diffusa</i>	21000	40	2.68	3.57	6.25	3.13
10	<i>Cyanotis axillaris</i>	10000	20	1.27	1.79	3.06	1.53
11	<i>Cynodon dactylon</i>	18000	10	2.29	0.89	3.18	1.59
12	<i>Cyperus distans</i>	26000	40	3.31	3.57	6.88	3.44
13	<i>Digitaria ciliaris</i>	71000	50	9.04	4.46	13.5	6.75
14	<i>Eclipta prostrata</i>	6000	20	0.76	1.79	2.55	1.28
15	<i>Eleusine indica</i>	18000	10	2.29	0.89	3.18	1.59
16	<i>Emilia sonchifolia</i>	7000	20	0.89	1.79	2.68	1.34
17	<i>Eragrostis japonica</i>	4000	10	0.51	0.89	1.4	0.7
18	<i>Eragrostis unioloides</i>	13000	20	1.66	1.79	3.45	1.73
19	<i>Hygrophila ringens</i>	9000	20	1.15	1.79	2.94	1.47
20	<i>Hyptis suaveolens</i>	16000	40	2.04	3.57	5.61	2.81
21	<i>Ipomoea asarifolia</i>	6000	20	0.76	1.79	2.55	1.28
22	<i>Ipomoea obscura</i>	2000	10	0.25	0.89	1.14	0.57
23	<i>Isachne miacea</i>	13000	20	1.66	1.79	3.45	1.73
24	<i>Ischaemum indicum</i>	186000	90	23.69	8.04	31.73	15.87
25	<i>Justicia japonica</i>	16000	20	2.04	1.79	3.83	1.92
26	<i>Kyllinga brevifolia</i>	17000	20	2.17	1.79	3.96	1.98
27	<i>Ludwigia hyssopifolia</i>	2000	10	0.25	0.89	1.14	0.57
28	<i>Ludwigia octovalvis</i>	11000	30	1.4	2.68	4.08	2.04
29	<i>Melochia corchorifolia</i>	2000	10	0.25	0.89	1.14	0.57
30	<i>Merremia turpethum</i>	6000	30	0.76	2.68	3.44	1.72
31	<i>Merremia umbellata</i>	4000	20	0.51	1.79	2.3	1.15

32	<i>Mimosa pudica</i>	12000	20	1.53	1.79	3.32	1.66
33	<i>Panicum repens</i>	26000	40	3.31	3.57	6.88	3.44
34	<i>Paspalum scrobiculatum</i>	26000	40	3.31	3.57	6.88	3.44
35	<i>Pennisetum hohenackeri</i>	4000	10	0.51	0.89	1.4	0.7
36	<i>Pennisetum polystachyon</i>	27000	40	3.44	3.57	7.01	3.51
37	<i>Phyllanthus urinaria</i>	5000	10	0.64	0.89	1.53	0.77
38	<i>Sacciolepis indica</i>	13000	30	1.66	2.68	4.34	2.17
39	<i>Sacciolepis interrupta</i>	9000	10	1.15	0.89	2.04	1.02
40	<i>Scoparia dulcis</i>	15000	30	1.91	2.68	4.59	2.3
41	<i>Setaria pumila</i>	1000	10	0.13	0.89	1.02	0.51
42	<i>Spermacoce articularis</i>	29000	30	3.69	2.68	6.37	3.19
43	<i>Spermacoce hispida</i>	3000	10	0.38	0.89	1.27	0.64
45	<i>Sphaeranthus indicus</i>	7000	10	0.89	0.89	1.78	0.89
46	<i>Urena lobata ssp. lobata</i>	7000	10	0.89	0.89	1.78	0.89
47	<i>Urena lobata ssp. sinuata</i>	3000	10	0.38	0.89	1.27	0.64
48	<i>Vernonia cinerea</i>	8000	20	1.02	1.79	2.81	1.41
49	<i>Xenostegia tridentata</i>	17000	40	2.17	3.57	5.74	2.87
	TOTAL	785000	1120	100	100	200	100

9.2.1.3. CHEMICAL FARMING

9.2.1.3.1. Over all diversity

A total of 56 species of vascular plants were recorded from the chemical farming area (Table 6). Most of them are woody species. Broad spectrum grass density is high. Percentage of indigenous flora and site specific vegetation is comparatively low. Percentage of other economically important and ecosystem specific species are also low, however percentage of fast spreading broad spectrum herbs are high. Erect woody herbs, grasses and sedges are more or less uniformly distributed in the area.



Table. 6. Overall floristic diversity during pre-harvest period in chemical farming area.

No	Species
1.	<i>Ageratum conyzoides</i>
2.	<i>Alternanthera paronychioides</i>
3.	<i>Alternanthera sessilis</i>
4.	<i>Ammannia baccifera</i>
5.	<i>Axonopus compressus</i>
6.	<i>Brachiaria miliiformis</i>
7.	<i>Chrysopogon aciculatus</i>
8.	<i>Commelina diffusa</i>
9.	<i>Cyanotis axillaris</i>
10.	<i>Cyperus castaneus</i>
11.	<i>Cyperus compactus</i>
12.	<i>Cyperus haspan</i>
13.	<i>Cyperus iria</i>
14.	<i>Datura metel</i>
15.	<i>Desmodium triflorum</i>
16.	<i>Desmodium triquetrum</i>
17.	<i>Digitaria ciliaris</i>
18.	<i>Eclipta prostrata</i>
19.	<i>Emilia sonchifolia</i>
20.	<i>Eragrostis tenella</i>
21.	<i>Eragrostis unioloides</i>
22.	<i>Eriocaulon sexangulare</i>
23.	<i>Fimbristylis aestivalis</i>
24.	<i>Fimbristylis dichotoma</i>
25.	<i>Fimbristylis microcarya</i>
26.	<i>Ipomoea asarifolia</i>
27.	<i>Isachne globosa</i>
28.	<i>Ischaemum indicum</i>
29.	<i>Kyllinga brevifolia</i>
30.	<i>Kyllinga nemoralis</i>
31.	<i>Limnophila repens</i>
32.	<i>Lindernia antipoda</i>
33.	<i>Ludwigia hyssopifolia</i>
34.	<i>Ludwigia octovalvis</i>
35.	<i>Marsilea minuta</i>
36.	<i>Merremia umbellata</i>
37.	<i>Microstachys chamaelea</i>
38.	<i>Murdannia spirata</i>
39.	<i>Oldenlandia corymbosa</i>
40.	<i>Oryza sativa</i>
41.	<i>Panicum repens</i>
42.	<i>Paspalidium flavidum</i>
43.	<i>Paspalum scrobiculata</i>

44.	<i>Passiflora foetida</i>
45.	<i>Phyllanthus urinaria</i>
46.	<i>Physalis angulata</i>
47.	<i>Pseudanthistiria umbellata</i>
48.	<i>Pycnus polystachyos</i>
49.	<i>Sacciolepis indica</i>
50.	<i>Sacciolepis interrupta</i>
51.	<i>Sauropus quadrangula</i>
52.	<i>Schoenoplectiella lateriflora</i>
53.	<i>Scoparia dulcis</i>
54.	<i>Synedrella nodiflora</i>
55.	<i>Vernonia cinerea</i>
56.	<i>Vigna radiata</i>

9.2.1.3.2. Floristic diversity of Paddy field

A total of 31 species of vascular plants were recorded from the paddy fields following chemical farming. Compared to grasses and sedges, other herbaceous members show higher diversity. Diversity of lower plant groups such as ferns, bryophytes, etc. and indigenous site species are also low.



9.2.1.3.3 Structural and compositional attributes of flora in paddyfield

Among the 31 species, *Sacciolepis interrupta* and *Fimbristylis aestivalis* have the highest densities followed by *Ludwigia octovalvis*, *Paspalum scrobiculatum*, *Cyanotis axillaris*, *Eriocaulon sexangulare*, *Panicum repens* and *Cyperus iria*. A gregarious weed *Sacciolepis interrupta* has the highest density and frequency, and this is the most common weed in paddy cultivation areas of Kerala.

Sacciolepis interrupta has the highest structural parameters such as density, frequency, and IVI. It indicates the gregarious nature of this wide spread and most common weed in chemical farming area. *Fimbristylis aestivalvis*, *Ludwigia octovalvis* and *Paspalum scrobiculatum* are the other species with IVI value of more than 10 (Table 7).



Table 7. Structural and compositional attributes of paddy land in Chemical farming area (Values in ha-1).

No.	Species	den	freq	rd	rf	ivi	rivi
1	<i>Alternanthera sessilis</i>	19000	20	1.51	2.08	3.59	1.8
2	<i>Ammannia baccifera</i>	4000	20	0.32	2.08	2.4	1.2
3	<i>Axonopus compressus</i>	14000	10	1.11	1.04	2.15	1.08
4	<i>Commelina diffusa</i>	10000	20	0.79	2.08	2.87	1.44
5	<i>Cyanotis axillaris</i>	59000	30	4.69	3.13	7.82	3.91
6	<i>Cyperus haspan</i>	21000	30	1.67	3.13	4.8	2.4
7	<i>Cyperus iria</i>	50000	50	3.97	5.21	9.18	4.59
8	<i>Eragrostis unioides</i>	25000	20	1.99	2.08	4.07	2.04
9	<i>Eriocaulon sexangulare</i>	57000	30	4.53	3.13	7.66	3.83
10	<i>Fimbristylis aestiva</i>	126000	50	10.01	5.21	15.22	7.61
11	<i>Fimbristylis dichotoma</i>	24000	20	1.91	2.08	3.99	2
12	<i>Fimbristylis microcarya</i>	26000	20	2.07	2.08	4.15	2.08
13	<i>Isachne globosa</i>	36000	30	2.86	3.13	5.99	3
14	<i>Ischaemum indicum</i>	30000	10	2.38	1.04	3.42	1.71
15	<i>Kyllinga brevifolia</i>	24000	20	1.91	2.08	3.99	2
16	<i>Limnophila repens</i>	3000	10	0.24	1.04	1.28	0.64
17	<i>Lindernia antipoda</i>	28000	30	2.22	3.13	5.35	2.68
18	<i>Ludwigia octovalvis</i>	75000	60	5.96	6.25	12.21	6.11
19	<i>Ceratopteris thalictroides</i>	8000	10	0.64	1.04	1.68	0.84
20	<i>Marsilea minuta</i>	10000	20	0.79	2.08	2.87	1.44
21	<i>Microstachys chamaelea</i>	5000	20	0.4	2.08	2.48	1.24
22	<i>Odenlandia corymbosa</i>	14000	30	1.11	3.13	4.24	2.12
23	<i>Oryza sativa</i>	195000	100	15.49	10.42	25.91	12.96
24	<i>Panicum repens</i>	53000	40	4.21	4.17	8.38	4.19
25	<i>Paspalum scrobiculata</i>	74000	40	5.88	4.17	10.05	5.03
26	<i>Phyllanthus urinaria</i>	24000	40	1.91	4.17	6.08	3.04
27	<i>Pycurus polystachyos</i>	18000	40	1.43	4.17	5.6	2.8
28	<i>Sacciolepis interrupta</i>	191000	80	15.17	8.33	23.5	11.75
29	<i>Schoenoplectiella lateriflora</i>	4000	10	0.32	1.04	1.36	0.68
30	<i>Scoparia dulcis</i>	19000	30	1.51	3.13	4.64	2.32
31	<i>Synedrella nodiflora</i>	13000	20	1.03	2.08	3.11	1.56
	TOTAL	1259000	960	100	100	200	100

9.2.1.3.4. Floristic diversity of bund

A total of 44 species were recorded from the bunds of paddyfields. Grasses and other erect herbs are common. Cyperacean members are few. Weeds are also common. Weeds which are removed from the paddyfields were dumped in the area. So diversity of weed, compared to paddyfield is high. Percentages of invasives are also high. Because of the suitability in growth factors, grasses have formed mats in most of the bunds.

9.2.1.3.5. Structural and compositional attributes of flora in bunds

Three grass species viz. *Ischaemum indicum*, *Digitaria ciliaris* and *Panicum repens* have highest densities, all are mat forming and last one is surviving by perennial rhizomes. A grass species, *Digitaria ciliaris* has the highest frequency followed by *Ageratum conyzoides*, *Ischaemum indicum* *Panicum repens* etc..

A grass *Ischaemum indicum* has the highest IVI value followed by *Digitaria ciliaris* and *Panicum repens*. These three species forms major part in the vegetal cover of the area. Grass cover over other herbaceous elements in bund indicates the increased disturbances (Table 8). It is also noted that the existing herbaceous members, other than than grass, are mainly weeds common in homesteads or disturbed deciduous forests.



Bunds with dense growth of weeds



Cryptolepis buchananii

Table 8. Structural and compositional attributes of Bunds in chemical farming area (Values in ha-1).

No.	Species	den	freq	rd	rf	ivi	rivi
1	<i>Ageratum conyzoides</i>	41000	70	3.52	6.03	9.55	4.78
2	<i>Alternanthera paronychioides</i>	8000	10	0.69	0.86	1.55	0.78
3	<i>Brachiaria miliiformis</i>	12000	10	1.03	0.86	1.89	0.95
4	<i>Chrysopogon aciculatus</i>	7000	10	0.6	0.86	1.46	0.73
5	<i>Commelina diffusa</i>	28000	30	2.4	2.59	4.99	2.5
6	<i>Cyanotis axillaris</i>	18000	20	1.55	1.72	3.27	1.64
7	<i>Cyperus castaneus</i>	12000	10	1.03	0.86	1.89	0.95
8	<i>Cyperus compactus</i>	18000	30	1.55	2.59	4.14	2.07
9	<i>Cyperus haspan</i>	20000	20	1.72	1.72	3.44	1.72
10	<i>Datura metel</i>	6000	30	0.52	2.59	3.11	1.56
11	<i>Desmodium triflorum</i>	8000	10	0.69	0.86	1.55	0.78
12	<i>Desmodium triquetrum</i>	8000	20	0.69	1.72	2.41	1.21
13	<i>Digitaria ciliaris</i>	146000	80	12.53	6.9	19.43	9.72
14	<i>Eclipta prostrata</i>	45000	60	3.86	5.17	9.03	4.52
15	<i>Emilia sonchifolia</i>	2000	10	0.17	0.86	1.03	0.52
16	<i>Eragrostis tenella</i>	13000	10	1.12	0.86	1.98	0.99
17	<i>Eragrostis uniolooides</i>	11000	10	0.94	0.86	1.8	0.9
18	<i>Fimbristylis dichotoma</i>	13000	30	1.12	2.59	3.71	1.86
19	<i>Fimbristylis microcarya</i>	30000	20	2.58	1.72	4.3	2.15
20	<i>Ipomoea asarifolia</i>	16000	40	1.37	3.45	4.82	2.41
21	<i>Isachne globosa</i>	5000	10	0.43	0.86	1.29	0.65
22	<i>Ischaemum indicum</i>	185000	60	15.88	5.17	21.05	10.53
23	<i>Kyllinga nemoralis</i>	12000	20	1.03	1.72	2.75	1.38
24	<i>Lindernia antipoda</i>	32000	20	2.75	1.72	4.47	2.24
25	<i>Ludwigia hyssopifolia</i>	55000	50	4.72	4.31	9.03	4.52
26	<i>Ludwigia octovalvis</i>	33000	20	2.83	1.72	4.55	2.28
27	<i>Marselia minuta</i>	13000	10	1.12	0.86	1.98	0.99
28	<i>Merremia umbellata</i>	3000	10	0.26	0.86	1.12	0.56
29	<i>Murdannia spirata</i>	23000	20	1.97	1.72	3.69	1.85
30	<i>Oldenlandia corymbosa</i>	7000	20	0.6	1.72	2.32	1.16
31	<i>Panicum repens</i>	78000	60	6.7	5.17	11.87	5.94
32	<i>Paspalidium flavidum</i>	6000	10	0.52	0.86	1.38	0.69
33	<i>Paspalum scrobiculatum</i>	57000	60	4.89	5.17	10.06	5.03
34	<i>Passiflora foetida</i>	4000	20	0.34	1.72	2.06	1.03
35	<i>Phyllanthus urinaria</i>	12000	20	1.03	1.72	2.75	1.38
36	<i>Physalis angulata</i>	4000	20	0.34	1.72	2.06	1.03
37	<i>Pseudanthistiria umbellata</i>	17000	10	1.46	0.86	2.32	1.16
38	<i>Sacciolepis indica</i>	77000	30	6.61	2.59	9.2	4.6
39	<i>Sacciolepis interrupta</i>	12000	20	1.03	1.72	2.75	1.38
40	<i>Sauropus quadrangularis</i>	2000	10	0.17	0.86	1.03	0.52
41	<i>Scoparia dulcis</i>	35000	60	3	5.17	8.17	4.09
42	<i>Synedrella nodiflora</i>	8000	10	0.69	0.86	1.55	0.78
43	<i>Vernonia cinerea</i>	21000	50	1.8	4.31	6.11	3.06
44	<i>Vigna radiata</i>	2000	10	0.17	0.86	1.03	0.52
	TOTAL	1165000	1160	100	100	200	100

9.2.2 POST-HARVEST PERIOD - MAY

9.2.2.1 Overall diversity

A total of 166 species were recorded during the post-harvest period, May (Table 9). This includes the species seen in paddyfields, bunds and adjacent homesteads following organic and chemical farming during the month of May. Since this season is the post harvest session, weeding practices and other field maintenance work is low, so representation of natural flora is comparatively high. Also due to dry season woody flora is dominating. Due to the flora from adjacent homesteads herbaceous elements are dominating over grass and sedge flora. Climbing herbs are also well represented. The percentage of delicate and marsh specific species are low.

Table. 9. List of species recorded during the post harvest period

No	Species
1.	<i>Achyranthes aspera</i>
2.	<i>Aerva lanata</i>
3.	<i>Aeschynomene americana</i>
4.	<i>Alloteropsis cimicina</i>
5.	<i>Alternanthera bettzickiana</i>
6.	<i>Alternanthera sessilis</i>
7.	<i>Alternanthera versicolor</i>
8.	<i>Alysicarpus vaginalis</i>
9.	<i>Amaranthus tricolor</i>
10.	<i>Ammannia baccifera</i>
11.	<i>Anamirta cocculus</i>
12.	<i>Anisochilus carnosus</i>
13.	<i>Areca catechu</i>
14.	<i>Aristolochia indica</i>
15.	<i>Artocarpus heterophyllus</i>
16.	<i>Axonopus compressus</i>
17.	<i>Azadirachta indica</i>
18.	<i>Barleria prionitis</i>
19.	<i>Bidens sulphurea</i>
20.	<i>Biophytum reinwardtii</i>
21.	<i>Blumea belangeriana</i>
22.	<i>Blumea oxyodonta</i>
23.	<i>Borassus flabellifer</i>
24.	<i>Bougainvillea spectabilis</i>
25.	<i>Brachiaria miliiformis</i>
26.	<i>Brachiaria remota</i>



27.	<i>Bridelia retusa</i>
28.	<i>Bulbostylis barbata</i>
29.	<i>Caesalpinia mimosoides</i>
30.	<i>Cajanus cajan</i>
31.	<i>Canna indica</i>
32.	<i>Capsicum annum</i>
33.	<i>Capsicum frutescens</i>
34.	<i>Cardiospermum halicacabum</i>
35.	<i>Chamaesyce hirta</i>
36.	<i>Chromolaena odorata</i>
37.	<i>Cinnamomum verum</i>
38.	<i>Cissampelos pareira</i>
39.	<i>Citrus medica</i>
40.	<i>Cleistanthus collinus</i>
41.	<i>Clerodendrum infortunatum</i>
42.	<i>Cocos nucifera</i>
43.	<i>Coldenia procumbens</i>
44.	<i>Commelina benghalensis</i>
45.	<i>Commelina diffusa</i>
46.	<i>Crossandra infundibuliformis</i>
47.	<i>Croton sparciflorus</i>
48.	<i>Cryptolepis buchananii</i>
49.	<i>Cyanotis axillaris</i>
50.	<i>Cyathula prostrata</i>
51.	<i>Cyclea peltata</i>
52.	<i>Cynodon dactylon</i>
53.	<i>Cyperus castaneus</i>
54.	<i>Cyperus compactus</i>
55.	<i>Cyperus cyperinus</i>
56.	<i>Cyperus iria</i>
57.	<i>Cyperus distans</i>
58.	<i>Dalbergia latifolia</i>
59.	<i>Dipteracanthus prostratus</i>
60.	<i>Duranta erecta</i>
61.	<i>Echinochloa colonum</i>

62.	<i>Eclipta prostrata</i>
63.	<i>Eleusine indica</i>
64.	<i>Emilia sonchifolia</i>
65.	<i>Eragrostis tenella</i>
66.	<i>Eragrostis unioloides</i>
67.	<i>Eragrostis viscosa</i>
68.	<i>Eriocaulon sexangulare</i>
69.	<i>Euphorbia hirta</i>
70.	<i>Ficus hispida</i>
71.	<i>Fimbristylis aestivalis</i>
72.	<i>Fimbristylis argentea</i>
73.	<i>Fimbristylis microcarpa</i>
74.	<i>Glinus oppositifolius</i>
75.	<i>Gliricidia sepium</i>
76.	<i>Glycosmis pentaphylla</i>
77.	<i>Glyricidia sepium</i>
78.	<i>Hemidesmus indicus</i>
79.	<i>Holarrhena pubescens</i>
80.	<i>Hydrolea zeylanica</i>
81.	<i>Hygrophila schullii</i>
82.	<i>Hyptis capitata</i>
83.	<i>Hyptis suaveolens</i>
84.	<i>Ichnocarpus frutescens</i>
85.	<i>Ipomea marginata</i>
86.	<i>Ipomoea asarifolia</i>
87.	<i>Ipomoea deccana</i>
88.	<i>Isachne globosa</i>
89.	<i>Ischaemum indicum</i>
90.	<i>Jasminum flexile</i>
91.	<i>Jasminum multiflorum</i>
92.	<i>Justicia gendarussa</i>
93.	<i>Justicia trinervis</i>
94.	<i>Lantana camara</i>
95.	<i>Lindernia anagallis</i>
96.	<i>Lindernia antipoda</i>
97.	<i>Ludwigia hyssopifolia</i>
98.	<i>Ludwigia octovalvis</i>
99.	<i>Lycopersicum esculentum</i>
100.	<i>Mangifera indica</i>
101.	<i>Marsilea minuta</i>
102.	<i>Meiochia corchorifolia</i>
103.	<i>Merremia umbellata</i>
104.	<i>Merremia vitifolia</i>
105.	<i>Microstachys chamaelea</i>
106.	<i>Mikania micrantha</i>
107.	<i>Milusa tomentosa</i>

108.	<i>Mimosa pudica</i>
109.	<i>Mollugo pentaphylla</i>
110.	<i>Momordica charantia</i>
111.	<i>Monochoria vaginalis</i>
112.	<i>Morinda pubescens</i>
113.	<i>Moringa pterygosperma</i>
114.	<i>Mukia maderaspatana</i>
115.	<i>Murraya koenigii</i>
116.	<i>Musa x paradisiaca</i>
117.	<i>Naregamia alata</i>
118.	<i>Ocimum gratissimum</i>
119.	<i>Ocimum tenuiflorum</i>
120.	<i>Oldenlandia corymbosa</i>
121.	<i>Oplismenus burmannii</i>
122.	<i>Oplismenus compositus</i>
123.	<i>Oryza sativa</i>
124.	<i>Panicum repens</i>
125.	<i>Paspalum conjugatum</i>
126.	<i>Paspalum scrobiculatum</i>
127.	<i>Passiflora foetida</i>
128.	<i>Pennisetum polystachyon</i>
129.	<i>Phaulopsis imbricata</i>
130.	<i>Phyllanthus nodiflora</i>
131.	<i>Phyllanthus amarus</i>
132.	<i>Phyllanthus emblica</i>
133.	<i>Phyllanthus reticulatus</i>
134.	<i>Phyllanthus urinaria</i>
135.	<i>Physalis angulata</i>
136.	<i>Piper nigrum</i>
137.	<i>Pongamia pinnata</i>
138.	<i>Pseudanthistiria umbellata</i>
139.	<i>Psidium guajava</i>
140.	<i>Pycnos polystachyos</i>
141.	<i>Rotala indica</i>
142.	<i>Sacciolepis indica</i>
143.	<i>Sacciolepis interrupta</i>
144.	<i>Schoenoplectiella lateriflora</i>
145.	<i>Scoparia dulcis</i>
146.	<i>Senna tora</i>
147.	<i>Sida acuta</i>
148.	<i>Sida alnifolia</i>
149.	<i>Sida cordata</i>
150.	<i>Sida cordifolia</i>
151.	<i>Solanum melongena</i>
152.	<i>Spermacoce articularis</i>
153.	<i>Sphaeranthus africanus</i>

154.	<i>Sphaeranthus indicus</i>
155.	<i>Strychnos nux-vomica</i>
156.	<i>Synedrella nodiflora</i>
157.	<i>Tamarindus indica</i>
158.	<i>Tectona grandis</i>
159.	<i>Themeda triandra</i>
160.	<i>Thevetia peruviana</i>
161.	<i>Triumfetta rhomboidea</i>
162.	<i>Urena lobata</i>
163.	<i>Utricularia graminifolia</i>
164.	<i>Vernonia cinerea</i>
165.	<i>Xenostegia tridentata</i>
166.	<i>Xylia xylocarpa</i>

9.2.2.2.ORGANIC FARMING

9.2.2.2.1.Overall diversity

A total of 163 taxa were recorded from the organic farming area (Table 10) during the month of May. Homesteads have high diversity and growth pattern. Compared to the seasonal flora of grasses and sedges, erect herbs and other woody plants are well represented. Since the homestead is with number of cultivated crops and other shade loving herbs, the percentage of exotic elements, especially the weeds are high. Herbs common to the natural forest are represented with high density and frequency. The percentage of site specific species and delicate marshy elements are also high. Due to the presence of flora from homesteads and bunds, seedlings of trees and shrubs are rationally represented in the flora.



Utilization of bunds

Table 10. List of species recorded from the organic farming area during May

No	Species
1.	<i>Achyranthes aspera</i>
2.	<i>Aerva lanata</i>
3.	<i>Aeschynomene americana</i>
4.	<i>Alloteropsis cimicina</i>
5.	<i>Alternanthera sessilis</i>
6.	<i>Alternanthera bettzickiana</i>
7.	<i>Alternanthera sessilis</i>
8.	<i>Alternanthera versicolor</i>
9.	<i>Alysicarpus vaginalis</i>
10.	<i>Amaranthus tricolor</i>
11.	<i>Ammannia baccifera</i>
12.	<i>Anamirta cocculus</i>
13.	<i>Areca catechu</i>
14.	<i>Aristolochia indica</i>
15.	<i>Artocarpus heterophyllus</i>
16.	<i>Axonopus compressus</i>
17.	<i>Azadirachta indica</i>
18.	<i>Barleria prionitis</i>
19.	<i>Bidens sulphurea</i>
20.	<i>Biophytum reinwardti</i>
21.	<i>Blumea belangeriana</i>
22.	<i>Blumea oxyodonta</i>
23.	<i>Borassus flabellifer</i>
24.	<i>Bougainvillea spectata</i>
25.	<i>Brachiaria miliiformis</i>
26.	<i>Brachiaria miliiform</i>
27.	<i>Bridelia retuse</i>
28.	<i>Bulbostylis barbata</i>
29.	<i>Caesalpinia mimosoides</i>
30.	<i>Cajanus cajan</i>
31.	<i>Canna indica</i>
32.	<i>Capsicum annum</i>
33.	<i>Capsicum frutescens</i>
34.	<i>Cardiospermum halicacabum</i>
35.	<i>Chamaesyce hirta</i>
36.	<i>Chromolaena odorata</i>
37.	<i>Chromolaena odoratum</i>
38.	<i>Cinnamomum verum</i>
39.	<i>Cissampelos pareira</i>
40.	<i>Citrus medica</i>
41.	<i>Cleistanthus collinus</i>

42.	<i>Clerodendrum infortunatum</i>
43.	<i>Cocos nucifera</i>
44.	<i>Commelina benghalensis</i>
45.	<i>Commelina diffusa</i>
46.	<i>Crossandra infundibuliformis</i>
47.	<i>Croton sparciflorus</i>
48.	<i>Cryptolepis buchanani</i>
49.	<i>Cyanotis axillaris</i>
50.	<i>Cyathula prostrata</i>
51.	<i>Cyclea peltata</i>
52.	<i>Cynodon dactylon</i>
53.	<i>Cyperus castaneus</i>
54.	<i>Cyperus compactus</i>
55.	<i>Cyperus iria</i>
56.	<i>Cyperus distans</i>
57.	<i>Dalbergia latifolia</i>
58.	<i>Dipteracanthus prostratus</i>
59.	<i>Duranta erecta</i>
60.	<i>Echinochloa colonum</i>
61.	<i>Eclipta prostrata</i>
62.	<i>Eleusine indica</i>
63.	<i>Emilia sonchifolia</i>
64.	<i>Eragrostis tenella</i>
65.	<i>Eragrostis unioloides</i>
66.	<i>Eragrostis viscosa</i>
67.	<i>Eriocaulon sexangula</i>
68.	<i>Euphorbia hirta</i>
69.	<i>Ficus hispida</i>
70.	<i>Fimbristylis aestivalis</i>
71.	<i>Fimbristylis argentea</i>
72.	<i>Fimbristylis microcarya</i>
73.	<i>Glinus oppositifolius</i>
74.	<i>Glinicidia sepium</i>
75.	<i>Glycosmis pentaphylla</i>
76.	<i>Glyricidia sepium</i>
77.	<i>Hemidesmus indicus</i>
78.	<i>Holarrhena pubescens</i>
79.	<i>Hydrolea zeylanica</i>
80.	<i>Hydrophila schulli</i>
81.	<i>Hyptis capitata</i>
82.	<i>Hyptis suaveolens</i>
83.	<i>Ichnocarpus frutescens</i>
84.	<i>Ipomea marginata</i>
85.	<i>Ipomea deccana</i>

86.	<i>Ipomea marginata</i>
87.	<i>Isachne globosa</i>
88.	<i>Ischaemum indicum</i>
89.	<i>Jasminum flexile</i>
90.	<i>Jasminum multiflorum</i>
91.	<i>Justicia gendarussa</i>
92.	<i>Justicia trinervia</i>
93.	<i>Lantana camara</i>
94.	<i>Lindernia anagallis</i>
95.	<i>Lindernia antipoda</i>
96.	<i>Ludwigia hyssopifolia</i>
97.	<i>Ludwigia octovalvis</i>
98.	<i>Lycopersicum esculentum</i>
99.	<i>Mangifera indica</i>
100.	<i>Melochia corchorifolia</i>
101.	<i>Merremia umbellata</i>
102.	<i>Merremia vitifolia</i>
103.	<i>Microstachys chamaelea</i>
104.	<i>Mikania micrantha</i>
105.	<i>Miliusa tomentosa</i>
106.	<i>Mimosa pudica</i>
107.	<i>Mollugo pentaphylla</i>
108.	<i>Momordica charantia</i>
109.	<i>Monochoria vaginalis</i>
110.	<i>Morinda pubescens</i>
111.	<i>Moringa pterygosperm</i>
112.	<i>Mukia maderaspatana</i>
113.	<i>Murraya koenigii</i>
114.	<i>Musa x paradisiacal</i>
115.	<i>Naregamia alata</i>
116.	<i>Ocimum gratissimum</i>
117.	<i>Ocimum tenuiflorum</i>
118.	<i>Oldenlandia corymbosa</i>
119.	<i>Oplismenus burmannii</i>
120.	<i>Oplismenus compositus</i>
121.	<i>Oryza sativa</i>
122.	<i>Panicum repens</i>
123.	<i>Paspalum conjugatum</i>
124.	<i>Paspalum scrobiculatum</i>
125.	<i>Passiflora foetida</i>
126.	<i>Pennisetum polystachyon</i>
127.	<i>Phaulopsis imbricata</i>
128.	<i>Phyla nodiflora</i>
129.	<i>Phyllanthus amarus</i>

130.	<i>Phyllanthus emblica</i>
131.	<i>Phyllanthus reticulatus</i>
132.	<i>Phyllanthus urinaria</i>
133.	<i>Physalis angulata</i>
134.	<i>Piper nigrum</i>
135.	<i>Pongamia pinnata</i>
136.	<i>Pseudanthistiria umbellata</i>
137.	<i>Psidium guajava</i>
138.	<i>Pycreus polystachyos</i>
139.	<i>Rotala indica</i>
140.	<i>Sacciolepis indica</i>
141.	<i>Sacciolepis interrupta</i>
142.	<i>Schoenoplectiella lateriflora</i>
143.	<i>Scoparia dulcis</i>
144.	<i>Senna tora</i>
145.	<i>Sida acuta</i>
146.	<i>Sida alnifolia</i>
147.	<i>Sida cordata</i>
148.	<i>Sida cordifolia</i>
149.	<i>Solanum melongena</i>
150.	<i>Spermacoce articularis</i>
151.	<i>Sphaeranthus africanus</i>
152.	<i>Sphaeranthus indicus</i>
153.	<i>Strychnos nux-vomica</i>
154.	<i>Synedrella nodiflora</i>
155.	<i>Tamarindus indica</i>
156.	<i>Tectona grandis</i>
157.	<i>Themeda triandra</i>
158.	<i>Thevetia peruviana</i>
159.	<i>Triumfetta rhomboidea</i>
160.	<i>Urena lobata</i>
161.	<i>Vernonia cinerea</i>
162.	<i>Xenostegia tridentate</i>
163.	<i>Xylia xylocarpa</i>



trees and shrubs seems to be high. Timber trees such as *Tectona grandis*, *Pterocarpus marsupium*, *Miliusa tomentosa*, etc. are common. Seasonal tuberous crops, leafy vegetables, etc. are growing in monsoon are well represented in most of the plots. Though the enumerated season is dry, due to small scale irrigation in homesteads the herbaceous flora is rich. Cultivars and other crops such as Zingibers and Turmeric are excluded from the enumeration for quantitative study. Altogether, a total of 103 species were recorded from this habitat (Table 11). Among these about 25 per cent are gregarious in growth form.

9.2.2.2 Floristic diversity of homesteads

Compared to other habitats studied in the area, homesteads are peculiar with the presence of large number exotic elements, variety of edibles and cultivars with various life forms. For assessing the diversity in homesteads, area mainly of Coconut intercropping with musa and other vegetables were selected. Percentage of Indigenous medicinal herbs,

9.2.2.3. Structural and compositional attributes of the flora of homesteads

Since the homesteads are planned cultivated lands, the seasonal herbaceous flora only is analysed for its structure and composition. The herbs common in open lands are gregarious in homesteads. From a total of 103 species (Table 11), a grass *Ischaemum indicum* has the highest density followed by *Hemidesmus indicus*, *Cynodon dactylon*, *Chromolaena*



Mimosa pudica

odorata, *Clerodendrum infortunatum*. An invasive alien weed *Chromolaena odorata* showed high frequency. All the above species are in top 5 list of frequency table, however their position is slightly changed. In frequency hierarchy the weed *Chromolaena odorata* has the highest frequency followed by *Hemidesmus indicus*, *Clerodendrum infortunatum*, *Mimosa pudica* and *Ischaemum indicum*. All these species are cosmopolitan in distribution and seen anywhere without any discrimination of habitat.

Among the 103 species enumerated from the sample plots 43 are with IVI values more than one. A cosmopolitan grass *Ischaemum indicum* has the highest IVI value followed by *Hemidesmus indicus*, *Chromolaena odorata*, *Clerodendrum infortunatum* and *Cynodon dactylon*. IVI values of seedlings of most of the tree species are less than one.



Mixed farming method

Musa plantation



Table 11. Structural and compositional attributes of homesteads (Values in ha-1)

No.	Species	den	freq	rd	rf	ivi	rivi
1	<i>Aerva lanata</i>	2500	10	0.48	1.09	1.57	0.79
2	<i>Alternanthera bettzickiana</i>	500	5	0.1	0.54	0.64	0.32
3	<i>Alternanthera sessilis</i>	3000	5	0.58	0.54	1.12	0.56
4	<i>Alternanthera versicolor</i>	1500	5	0.29	0.54	0.83	0.42
5	<i>Amaranthus tricolor</i>	2000	10	0.39	1.09	1.48	0.74
6	<i>Anamirta cocculus</i>	1000	5	0.19	0.54	0.73	0.37
7	<i>Areca catechu</i>	500	5	0.1	0.54	0.64	0.32
8	<i>Aristolochia indica</i>	1000	5	0.19	0.54	0.73	0.37
9	<i>Artocarpus heterophyllus</i>	500	5	0.1	0.54	0.64	0.32
10	<i>Azadirachta indica</i>	500	5	0.1	0.54	0.64	0.32
11	<i>Barleria prionitis</i>	9000	10	1.74	1.09	2.83	1.42
12	<i>Bidens sulphurea</i>	1500	5	0.29	0.54	0.83	0.42
13	<i>Biopyrum reinwardtii</i>	2000	5	0.39	0.54	0.93	0.47
14	<i>Blumea belangeriana</i>	11000	15	2.13	1.63	3.76	1.88
15	<i>Borassus flabellifer</i>	16500	25	3.19	2.72	5.91	2.96
16	<i>Bougainvillea spectabilis</i>	500	5	0.1	0.54	0.64	0.32
17	<i>Bridelia retusa</i>	500	5	0.1	0.54	0.64	0.32
18	<i>Caesalpinia mimosoides</i>	4000	10	0.77	1.09	1.86	0.93
19	<i>Cajanus cajan</i>	6500	5	1.26	0.54	1.8	0.9
20	<i>Canna indica</i>	4000	5	0.77	0.54	1.31	0.66
21	<i>Capsicum annum</i>	1500	5	0.29	0.54	0.83	0.42
22	<i>Capsicum frutescens</i>	2000	5	0.39	0.54	0.93	0.47
23	<i>Cardiospermum halicacabum</i>	2500	10	0.48	1.09	1.57	0.79
24	<i>Chromolaena odorata</i>	25000	50	4.84	5.43	10.27	5.14
25	<i>Cinnamomum verum</i>	500	5	0.1	0.54	0.64	0.32
26	<i>Citrus medica</i>	500	5	0.1	0.54	0.64	0.32
27	<i>Cleistanthus collinus</i>	2500	10	0.48	1.09	1.57	0.79
28	<i>Clerodendrum infortunatum</i>	22000	40	4.26	4.35	8.61	4.31
29	<i>Cocos nucifera</i>	8000	5	1.55	0.54	2.09	1.05
30	<i>Commelina benghalensis</i>	500	5	0.1	0.54	0.64	0.32
31	<i>Crossandra infundibuliformis</i>	1500	5	0.29	0.54	0.83	0.42
32	<i>Croton sparciflorus</i>	500	5	0.1	0.54	0.64	0.32
33	<i>Cryptolepis buchananii</i>	1000	5	0.19	0.54	0.73	0.37
34	<i>Cyathula prostrata</i>	500	5	0.1	0.54	0.64	0.32
35	<i>Cyclea peltata</i>	500	5	0.1	0.54	0.84	0.32
36	<i>Cynodon dactylon</i>	35000	10	6.77	1.09	7.86	3.93
37	<i>Cyperus compactus</i>	3000	5	0.58	0.54	1.12	0.56
38	<i>Dalbergia latifolia</i>	500	5	0.1	0.54	0.64	0.32
39	<i>Dipteracanthus prostrates</i>	1000	5	0.19	0.54	0.73	0.37
40	<i>Duranta erecta</i>	1500	5	0.29	0.54	0.83	0.42
41	<i>Eragrostis unioides</i>	1000	5	0.19	0.54	0.73	0.37
42	<i>Euphorbia hirta</i>	500	5	0.1	0.54	0.64	0.32
43	<i>Ficus hispida</i>	1500	10	0.29	1.09	1.38	0.69
44	<i>Glicicidia sepium</i>	6000	10	1.16	1.09	2.25	1.13

45	<i>Glycosmis pentaphylla</i>	6000	10	1.16	1.09	2.25	1.13
46	<i>Hemidesmus indicus</i>	45000	40	8.7	4.35	13.05	6.53
47	<i>Holarrhena pubescens</i>	500	5	0.1	0.54	0.64	0.32
48	<i>Hyptis capitata</i>	4000	10	0.77	1.09	1.86	0.93
49	<i>Hyptis suaveolens</i>	2000	5	0.39	0.54	0.93	0.47
50	<i>Ichnocarpus frutescens</i>	7500	5	1.45	0.54	1.99	1
51	<i>Ipomea asarifolia</i>	1500	5	0.29	0.54	0.83	0.42
52	<i>Ipomea deccana</i>	1500	5	0.29	0.54	0.83	0.42
53	<i>Ipomea marginata</i>	5000	10	0.97	1.09	2.06	1.03
54	<i>Ischaemum indicum</i>	108500	35	20.99	3.8	24.79	12.4
55	<i>Jasminium flexile</i>	1000	5	0.19	0.54	0.73	0.37
56	<i>Jasminum multiflorum</i>	1000	5	0.19	0.54	0.73	0.37
57	<i>Justicia gendarussa</i>	1500	5	0.29	0.54	0.83	0.42
58	<i>Justicia trinervia</i>	4000	15	0.77	1.63	2.4	1.2
59	<i>Lantana camara</i>	500	5	0.1	0.54	0.64	0.32
60	<i>Lycopersicum esculentum</i>	1500	5	0.29	0.54	0.83	0.42
61	<i>Mangifera indica</i>	1500	5	0.29	0.54	0.83	0.42
62	<i>Merremia umbellata</i>	1000	5	0.19	0.54	0.73	0.37
63	<i>Merremia vitifolia</i>	11000	20	2.13	2.17	4.3	2.15
64	<i>Mikania micrantha</i>	3500	5	0.68	0.54	1.22	0.61
65	<i>Milusa tomentosa</i>	1500	5	0.29	0.54	0.83	0.42
67	<i>Mimosa pudica</i>	14000	40	2.71	4.35	7.06	3.53
68	<i>Momordica charantia</i>	1500	5	0.29	0.54	0.83	0.42
69	<i>Morinda pubescens</i>	1500	10	0.29	1.09	1.38	0.69
70	<i>Moringa pterygosperm</i>	500	5	0.1	0.54	0.64	0.32
71	<i>Mukia mederaspatana</i>	500	5	0.1	0.54	0.64	0.32
72	<i>Murraya koenigii</i>	500	5	0.1	0.54	0.64	0.32
73	<i>Musa x paradisiaca</i>	1000	5	0.19	0.54	0.73	0.37
74	<i>Naregamia alata</i>	1500	10	0.29	1.09	1.38	0.69
75	<i>Ocimum gratissimum</i>	1000	5	0.19	0.54	0.73	0.37
76	<i>Ocimum tenuiflorum</i>	500	5	0.1	0.54	0.64	0.32
77	<i>Oplismenus burmannii</i>	5000	5	0.97	0.54	1.51	0.76
78	<i>Oplismenus compositus</i>	10000	5	1.93	0.54	2.47	1.24
79	<i>Passiflora foetida</i>	1000	5	0.19	0.54	0.73	0.37
80	<i>Phaulopsis imbricata</i>	16000	15	3.09	1.63	4.72	2.36
81	<i>Phyllanthus amarus</i>	1500	5	0.29	0.54	0.83	0.42
82	<i>Phyllanthus emblica</i>	500	5	0.1	0.54	0.64	0.32
83	<i>Phyllanthus reticulatus</i>	2000	10	0.39	1.09	1.48	0.74
84	<i>Phyllanthus urinaria</i>	500	5	0.1	0.54	0.64	0.32
85	<i>Physalis angulata</i>	2500	10	0.48	1.09	1.57	0.79
86	<i>Piper nigrum</i>	1000	5	0.19	0.54	0.73	0.37
87	<i>Pongamia pinnata</i>	500	5	0.1	0.54	0.64	0.32
88	<i>Psidium guajava</i>	14000	10	2.71	1.09	3.8	1.9
89	<i>Scoparia dulcis</i>	3000	10	0.58	1.09	1.67	0.84
90	<i>Sida acuta</i>	500	5	0.1	0.54	0.64	0.32
91	<i>Sida alnifolia</i>	1000	5	0.19	0.54	0.73	0.37

92	<i>Sida cordata</i>	2000	10	0.39	1.09	1.48	0.74
93	<i>Sida cordifolia</i>	500	5	0.1	0.54	0.64	0.32
94	<i>Solanum melongena</i>	1500	5	0.29	0.54	0.83	0.42
95	<i>Sphaeranthus indicus</i>	2000	5	0.39	0.54	0.93	0.47
96	<i>Strychnos nux-vomica</i>	1500	10	0.29	1.09	1.38	0.69
97	<i>Synedrella nodiflora</i>	18000	25	3.48	2.72	6.2	3.1
98	<i>Tamarindus indica</i>	1500	5	0.29	0.54	0.83	0.42
99	<i>Tectona grandis</i>	3000	20	0.58	2.17	2.75	1.38
100	<i>Thevetia peruviana</i>	500	5	0.1	0.54	0.64	0.32
101	<i>Triumfetta rhomboidea</i>	4000	10	0.77	1.09	1.86	0.93
102	<i>Urena lobata</i>	3000	25	0.58	2.72	3.3	1.65
103	<i>Vernonia cinerea</i>	500	5	0.1	0.54	0.64	0.32
104	<i>Xylia xylocarpa</i>	500	5	0.1	0.54	0.64	0.32
	TOTAL	517000	920	100	100	200	100

9.2.2.2.4. Floristic diversity of paddy field

A total of 41 species were recorded from the paddyfields of organic farming area during May. Though the natural flora in paddyfield is dominated by sedges and grasses, the percentage of erect woody herbs are comparatively high. Ferns commonly occurring in marshy lands are very low in the area. Woody herbs are gregarious with high density. Since the season is of dry plants, common group of weeds in the paddy lands locally called as Pollakkala, is low. However species such as *Sacciolepis interrupta*, *Cyanotis axillaris*, *Cyperus compactus*, *Cyperus cyperinus*, *Cyperus distans*, *Cyperus digitatus*, *Cyperus distans*, *Cyperus iria*, *Hygrophila ringens*, *Ludwigia octovalvis*, *Ludwigia hyssopifolia*, etc are gregarious during this season.

9.2.2.2.5. Structural and compositional attributes of flora

Among the 41 species recorded in the sample plots of paddyfield, dominated ones are herbs rather than grass or sedges. An erect herb *Ludwigia octovalvis* has the highest density followed by *Pycneus polystachyos*, *Bulbostylis barbata*, *Sphaeranthus indicus* and *Schoenoplectiella lateriflora*. A perennial herb *Sphaeranthus indicus* has the highest frequency followed by *Ludwigia hyssopifolia*, *Pycneus polystachyos*, *Ludwigia octovalvis* and *Schoenoplectiella lateriflora* (Table 12).

An erect herb common to marsh lands *Ludwigia octovalvis* has the highest IVI followed by *Pycneus polystachyos*, *Sphaeranthus indicus*, *Ludwigia hyssopifolia* and *Schoenoplectiella lateriflora*. All the species in homesteads have IVI values of more than one.



Table 12. Structural and compositional attributes of paddyfields (Values in ha-1).

No.	Species	den	freq	rd	rf	ivi	rivi
1	<i>Oldenlandia corymbosa</i>	500	20	0.09	3.67	3.76	1.88
2	<i>Alloteropsis cimicina</i>	2000	5	0.34	0.92	1.26	0.63
3	<i>Ammannia baccifera</i>	1000	5	0.17	0.92	1.09	0.55
4	<i>Axonopus compressus</i>	4500	5	0.77	0.92	1.69	0.85
5	<i>Biophytum reinwardtii</i>	500	5	0.09	0.92	1.01	0.51
6	<i>Brachiaria miliiformis</i>	6000	15	1.03	2.75	3.78	1.89
7	<i>Bulbostylis barbata</i>	32500	20	5.56	3.67	9.23	4.62
8	<i>Cyperus castaneus</i>	15000	15	2.57	2.75	5.32	2.66
9	<i>Cyperus compactus</i>	8500	10	1.45	1.83	3.28	1.64
10	<i>Cyperus distans</i>	3000	10	0.51	1.83	2.34	1.17
11	<i>Eragrostis unioides</i>	3000	5	0.51	0.92	1.43	0.72
12	<i>Eragrostis viscose</i>	500	5	0.09	0.92	1.01	0.51
13	<i>Eriocaulon sexangulare</i>	2000	5	0.34	0.92	1.26	0.63
14	<i>Fimbristylis aestiva</i>	11000	10	1.88	1.83	3.71	1.86
15	<i>Fimbristylis argentea</i>	6000	10	1.03	1.83	2.86	1.43
16	<i>Hemidesmus indicus</i>	1000	5	0.17	0.92	1.09	0.55
17	<i>Hydrolea zeylanica</i>	12000	25	2.05	4.59	6.64	3.32
18	<i>Isachne globosa</i>	2000	5	0.34	0.92	1.26	0.63
19	<i>Ischaemum indicum</i>	6000	5	1.03	0.92	1.95	0.98
20	<i>Lindernia anagallis</i>	1000	5	0.17	0.92	1.09	0.55
21	<i>Ludwigia hyssopifolia</i>	28500	35	4.88	6.42	11.3	5.65
22	<i>Ludwigia octovalvis</i>	101500	25	17.37	4.59	21.96	10.98
23	<i>Mollugo lotoides</i>	2500	5	0.43	0.92	1.35	0.68
24	<i>Mollugo pentaphylla</i>	7500	5	1.28	0.92	2.2	1.1
25	<i>Monochoria vaginalis</i>	3000	5	0.51	0.92	1.43	0.72
26	<i>Naregamia alata</i>	1000	5	0.17	0.92	1.09	0.55
27	<i>Oldenlandia corymbosa</i>	500	5	0.09	0.92	1.01	0.51
28	<i>Oryza sativa</i>	172000	100	29.43	18.35	47.78	23.89
29	<i>Panicum repens</i>	6500	5	1.11	0.92	2.03	1.02
30	<i>Paspalum conjugatum</i>	6000	5	1.03	0.92	1.95	0.98
31	<i>Paspalum scrobiculatum</i>	1000	5	0.17	0.92	1.09	0.55
32	<i>Phyla nodiflora</i>	1000	5	0.17	0.92	1.09	0.55
33	<i>Pycreus polystachyos</i>	47000	30	8.04	5.5	13.54	6.77
34	<i>Rotala indica</i>	500	5	0.09	0.92	1.01	0.51
35	<i>Sacciolepis indica</i>	8500	20	1.45	3.67	5.12	2.56
36	<i>Sacciolepis interrupta</i>	2000	5	0.34	0.92	1.26	0.63
37	<i>Schoenoplectiella lateriflora</i>	30500	25	5.22	4.59	9.81	4.91
38	<i>Sphaeranthus Africana</i>	15000	20	2.57	3.67	6.24	3.12
39	<i>Sphaeranthus indicus</i>	31500	40	5.39	7.34	12.73	6.37
40	<i>Themeda triandra</i>	500	5	0.09	0.92	1.01	0.51
	TOTAL	584500	545	100	100	200	100

9.2.2.2.6 Floristic diversity of bund

A total of 60 species were recorded from the bunds of the paddyfield during this season. Erect woody species and perennial rhizomatous grass and sedges are common. *Sphaeranthus indicus*, *Hygrophila schulli*, *Ludwigia hyssopifolia*, *Cynodon dactylon*, etc. and climbers such as *Xenostegia tridentata*, *Ipomoea asarifolia*, etc. are common. Seedlings of trees and other woody species are also common. Grasses such as *Panicum repens*, *Pennisetum polystachyon*, etc. are perennial and gregarious during this season. On the availability of water other grasses and sedges gradually turns alive and spread over



the area. Some gregarious weed grows with high density. Vegetable cultivation, coconut planting and trees planting, weed dumping etc from the paddyfields influence the diversity of bunds.

9.2.2.2.7 Structural and compositional attributes of flora in Bunds of paddy field

Among the 60 species recorded from bunds of paddyfield, a rhizomatous grass *Cynodon dactylon* has the highest density followed by *Scoparia dulcis*, *Brachiaria miliiformis*, *Blumea belangeriana* and *Mimosa pudica*. Most of the species with higher percentage of density are found to be woody herbs. Common herbs seen in marshy lands are rare in the bunds during this season (Table 13). A medicinal herb *Scoparia dulcis* has the highest frequency followed by *Blumea belangeriana*, *Mimosa pudica*, *Sphaeranthus indicus* and *Eclipta prostrata*.

As in density, the grass *Cynodon dactylon* has the highest IVI value followed by *Scoparia dulcis*, *Blumea belangeriana*, *Mimosa pudica* and *Brachiaria miliiformis*. Among 60 species, 23 species with an IVI value of less than one. The top 5 species in the IVI table forms more than 40 per cent of IVI value.

Table 13. Structural and compositional attributes of bund (Values in ha⁻¹).

Sl. No.	Species	den	freq	rd	rf	lvi	rivi
1	<i>Achyranthes aspera</i>	2000	10	0.43	1.34	1.77	0.89
2	<i>Aeschynomene americana</i>	500	5	0.11	0.67	0.78	0.39
3	<i>Alternanthera sessilis</i>	6000	25	1.28	3.36	4.64	2.32
4	<i>Alysicarpus vaginalis</i>	1500	5	0.32	0.67	0.99	0.5
5	<i>Azadirachta indica</i>	1000	5	0.21	0.67	0.88	0.44
6	<i>Blumea belangeriana</i>	30500	40	6.53	5.37	11.9	5.95
7	<i>Blumea oxydonta</i>	6500	20	1.39	2.68	4.07	2.04
8	<i>Brachiaria miliiformis</i>	35000	5	7.49	0.67	8.16	4.08
9	<i>Chamaesyce hirta</i>	1500	10	0.32	1.34	1.66	0.83
10	<i>Chromolaena odoratum</i>	5500	20	1.18	2.68	3.86	1.93
11	<i>Cissampelos pareira</i>	2000	5	0.43	0.67	1.1	0.55
12	<i>Clerodendrum infortunatum</i>	2500	10	0.54	1.34	1.88	0.94
13	<i>Commelina diffusa</i>	3500	5	0.75	0.67	1.42	0.71
14	<i>Cyanotis axillaris</i>	2000	5	0.43	0.67	1.1	0.55
15	<i>Cynodon dactylon</i>	139000	25	29.76	3.36	33.12	16.56
16	<i>Cyperus iria</i>	2000	10	0.43	1.34	1.77	0.89
17	<i>Echinochloa colonum</i>	5500	10	1.18	1.34	2.52	1.26

18	<i>Eclipta prostrata</i>	10000	35	2.14	4.7	6.84	3.42
19	<i>Eleusine indica</i>	1500	5	0.32	0.67	0.99	0.5
20	<i>Emilia sonchifolia</i>	1500	15	0.32	2.01	2.33	1.17
21	<i>Eragrostis tenella</i>	8500	10	1.82	1.34	3.16	1.58
22	<i>Eragrostis uniolooides</i>	2000	5	0.43	0.67	1.1	0.55
23	<i>Eragrostis viscosa</i>	1500	5	0.32	0.67	0.99	0.5
24	<i>Fimbristylis microcarya</i>	5500	15	1.18	2.01	3.19	1.6
25	<i>Glinus oppositifolia</i>	3000	10	0.64	1.34	1.98	0.99
26	<i>Glyricidia sepium</i>	1000	5	0.21	0.67	0.88	0.44
27	<i>Hydrophila ringens</i>	500	5	0.11	0.67	0.78	0.39
28	<i>Hydrophila schullii</i>	4500	10	0.96	1.34	2.3	1.15
29	<i>Ischaemum indicum</i>	5000	10	1.07	1.34	2.41	1.21
30	<i>Lantana camara</i>	1000	5	0.21	0.67	0.88	0.44
31	<i>Lindernia antipoda</i>	6500	15	1.39	2.01	3.4	1.7
32	<i>Ludwigia hyssopifolia</i>	15500	25	3.32	3.36	6.68	3.34
33	<i>Ludwigia peruviana</i>	6500	5	1.39	0.67	2.06	1.03
34	<i>Ludwigia octovalvis</i>	4500	15	0.96	2.01	2.97	1.49
35	<i>Melochia corchorifolia</i>	500	5	0.11	0.67	0.78	0.39
36	<i>Merremia umbellata</i>	500	5	0.11	0.67	0.78	0.39
37	<i>Microstachys chamaelea</i>	500	5	0.11	0.67	0.78	0.39
38	<i>Mimosa pudica</i>	16500	35	3.53	4.7	8.23	4.12
39	<i>Mollugo pentaphylla</i>	1000	5	0.21	0.67	0.88	0.44
40	<i>Morinda pubescens</i>	1500	5	0.32	0.67	0.99	0.5
41	<i>Oldenlandia corymbosa</i>	1500	5	0.32	0.67	0.99	0.5
42	<i>Panicum repens</i>	500	5	0.11	0.67	0.78	0.39
43	<i>Paspalum scrobiculatum</i>	500	5	0.11	0.67	0.78	0.39
44	<i>Pennisetum polystachyon</i>	2000	5	0.43	0.67	1.1	0.55
45	<i>Phyla nodiflora</i>	1000	5	0.21	0.67	0.88	0.44
46	<i>Phyllanthus rheedei</i>	2500	5	0.54	0.67	1.21	0.61
47	<i>Phyllanthus amarus</i>	15000	20	3.21	2.88	5.89	2.95
48	<i>Phyllanthus urinaria</i>	1000	5	0.21	0.67	0.88	0.44
49	<i>Pseudanthistiria umbellata</i>	6500	15	1.39	2.01	3.4	1.7
50	<i>Sacciolepis indica</i>	1000	5	0.21	0.67	0.88	0.44
51	<i>Scoparia dulcis</i>	45500	70	9.74	9.4	19.14	9.57
52	<i>Senna tora</i>	1000	5	0.21	0.67	0.88	0.44
53	<i>Sida alnifolia</i>	1500	5	0.32	0.67	0.99	0.5
54	<i>Spermacoce articularis</i>	5000	10	1.07	1.34	2.41	1.21
55	<i>Sphaeranthus africana</i>	3500	10	0.75	1.34	2.09	1.05
56	<i>Sphaeranthus indicus</i>	14500	35	3.1	4.7	7.8	3.9
57	<i>Synedrella nodiflora</i>	5000	25	1.07	3.36	4.43	2.22
58	<i>Themeda triandra</i>	500	5	0.11	0.67	0.78	0.39
59	<i>Vernonia cinerea</i>	12000	30	2.57	4.03	6.6	3.3
60	<i>Xenostegia tridentata</i>	1500	5	0.32	0.67	0.99	0.5
	TOTAL	467000	745	100	100	200	100

9.2.2.3 CHEMICAL FARMING

9.2.2.3.1 Overall diversity

A total of 48 species of vascular plants were recorded from the chemical farming area during May (Table 14). Most of them are woody species with a broad spectrum growth habit. Percentage of indigenous flora, other economically important and habitat specific species are low. Percentages of fast spreading broad spectrum herbs are high. Erect woody herbs, climbers, grasses and sedges are more or less uniformly distributed in the area. Percentage of site specific vegetation is low. Data shows that seedlings and saplings of indigenous trees are high in the area.



Table 14. list of species recorded from the chemical farming area during May.

No	Species
1.	<i>Alternanthera sessilis</i>
2.	<i>Ammannia baccifera</i>
3.	<i>Anisochilus carnosus</i>
4.	<i>Azadiracta indica</i>
5.	<i>Blumea belangeriana</i>
6.	<i>Blumea oxyodonta</i>
7.	<i>Brachiaria remota</i>
8.	<i>Cajanus cajan</i>
9.	<i>Chamaesyce hirta</i>
10.	<i>Chromolaena odorata</i>
11.	<i>Coldenia procumbens</i>
12.	<i>Commelina benghalensis</i>
13.	<i>Cyanotis axillaris</i>
14.	<i>Cynodon dactylon</i>
15.	<i>Cyperus compactus</i>
16.	<i>Cyperus cyperinus</i>
17.	<i>Eclipta prostrata</i>

18.	<i>Eragrostis tenella</i>
19.	<i>Eragrostis unioloides</i>
20.	<i>Eragrostis viscosa</i>
21.	<i>Hydrolea zeylanica</i>
22.	<i>Hygrophila schullii</i>
23.	<i>Hyptis suaveolens</i>
24.	<i>Ipomoea asarifolia</i>
25.	<i>Ipomoea marginata</i>
26.	<i>Isachne globosa</i>
27.	<i>Ischaemum indicum</i>
28.	<i>Lantana camara</i>
29.	<i>Lindernia antipoda</i>
30.	<i>Ludwigia hyssopifolia</i>
31.	<i>Ludwigia octovalvis</i>
32.	<i>Marsilea minuta</i>
33.	<i>Mimosa pudica</i>
34.	<i>Mollugo pentaphylla</i>
35.	<i>Monochoria vaginalis</i>
36.	<i>Morinda pubescens</i>
37.	<i>Oryza sativa</i>
38.	<i>Panicum repens</i>
39.	<i>Pennisetum polystachyon</i>
40.	<i>Sacciolepis interrupta</i>
41.	<i>Scoparia dulcis</i>
42.	<i>Sphaeranthus africanus</i>
43.	<i>Sphaeranthus indicus</i>
44.	<i>Synedrella nodiflora</i>
45.	<i>Urena lobata</i>
46.	<i>Utricularia graminifolia</i>
47.	<i>Vernonia cinerea</i>
48.	<i>Xenostegia tridentata</i>

9.2.2.3.2 Floristic diversity of paddyfield

A total of 25 species of vascular plants were recorded from the paddy fields of chemical



farming area during May. Woody herbs are dominating and most they have broad spectrum of growth habit. Percentage of indigenous flora is very low. Percentage of other economically important and habitat specific species are low, however percentage of fast spreading broad spectrum herbs are high. Perennial herbs, woody subshrubs, climbers, grasses and sedges are more or less uniformly distributed in the area. Percentage of habitat specific vegetation is low. Invasive alien weeds such as *Monochoria vaginalis* and *Mikania macrantha* was recorded the area. The presence of this species indicates higher disturbance level in the flora and changes in soil properties.

9.2.2.3.3 Structural and compositional attributes of flora in the paddy field

A total 25 species were recorded from the sample plots laid out in paddy field. *Marsilea minuta* has the highest density followed by a. *Utricularia graminifolia*, *Cyperus compactus*, *Ludwigia hyssopifolia* and *Isachne globosa*. A gregarious weed in the paddy field, *Sacciolepis interrupta* is not recorded from the paddy field. A gregarious sedge *Cyperus compactus* has the highest frequency followed by *Ludwigia hyssopifolia*, *Cyanotis axillaris* and *Sphaeranthus indicus* (Table 15).

A gregarious herb *Marsilea minuta* has the highest IVI value followed by *Cyperus compactus*, *Ludwigia hyssopifolia*, *Utricularia graminifolia*, *Cyanotis axillaris* etc.. Among the 25 species, 8 species has the lowest IVI value of less than one.

Table 15. Structural and compositional attributes of paddyfield (Values in ha-1).

No.	Species	den	freq	rd	rf	ivi	rivi
1	<i>Ammannia baccifera</i>	2500	10	0.7	2.5	3.2	1.6
2	<i>Blumea belangeriana</i>	500	5	0.14	1.25	1.39	0.7
3	<i>Brachiaria remota</i>	3000	5	0.84	1.25	2.09	1.05
4	<i>Commelina benghalens</i>	500	5	0.14	1.25	1.39	0.7
5	<i>Cyanotis axillaris</i>	8500	20	2.38	5	7.38	3.69
6	<i>Cynodon dactylon</i>	2000	5	0.56	1.25	1.81	0.91
7	<i>Cyperus compactus</i>	12000	40	3.36	10	13.36	6.68
8	<i>Cyperus cyperinus</i>	9500	15	2.66	3.75	6.41	3.21
9	<i>Eclipta prostrata</i>	4000	15	1.12	3.75	4.87	2.44
10	<i>Eragrostis tenella</i>	3000	5	0.84	1.25	2.09	1.05
11	<i>Hygrophila schullii</i>	1000	5	0.28	1.25	1.53	0.77
12	<i>Ipomoea asarifolia</i>	1500	5	0.42	1.25	1.67	0.84
13	<i>Isachne globosa</i>	10500	15	2.94	3.75	6.69	3.35
14	<i>Ludwigia hyssopifolia</i>	11000	35	3.08	8.75	11.83	5.92
15	<i>Ludwigia octovalvis</i>	9500	10	2.66	2.5	5.16	2.58
16	<i>Marsilea minuta</i>	43500	20	12.18	5	17.18	8.59
17	<i>Mollugo pentaphylla</i>	6000	10	1.68	2.5	4.18	2.09
18	<i>Monochoria vaginalis</i>	2500	5	0.7	1.25	1.95	0.98
19	<i>Mikania macrantha</i>	500	5	0.14	1.25	1.39	0.7
20	<i>Dryza sativa</i>	179500	100	50.28	25	75.28	37.64
21	<i>Scoparia dulcis</i>	1000	10	0.28	2.5	2.78	1.39
22	<i>Sphaeranthus africanus</i>	1500	5	0.42	1.25	1.67	0.84
23	<i>Sphaeranthus indicus</i>	8000	20	2.24	5	7.24	3.62
24	<i>Schoenoplectiella lateriflora</i>	6000	20	1.68	5	6.68	3.34
25	<i>Utricularia graminifolia</i>	29500	10	8.26	2.5	10.76	5.38
	TOTAL	357000	400	100	100	200	100

9.2.2.3.4. Floristic diversity of bund

A total of 39 species were recorded from bunds of the paddyfield during this season. Erect woody species common to homesteads and surrounding moist deciduous forests are common along the bunds. Gregarious weeds in the region such as *Lantana camara*, *Hyptis suaveolens*, *Chromolaena odorata*, etc are well represented in the bunds. Woody herbs such as *Sphaeranthus indicus*, *Hygrophila schullii*, *Ludwigia hyssopifolia*, etc. and climbers such as *Xenostegia tridentata*, *Ipomoea asarifolia*, etc. are common. Seedlings of trees and other woody species are also very common. Some grasses such as *Panicum repens*, *Pennisetum polystachyon*, etc. are well represented in the plots.

9.2.2.3.5 Structural and compositional attributes of flora in Bunds of paddy field

Among the 39 species recorded from bunds of paddyfield, *Cynodon dactylon* has the highest density followed by *Ludwigia hyssopifolia*, *Scoparia dulcis*, *Sphaeranthus africanus* and *Sphaeranthus indicus*. Invasive alien weeds and other gregarious grasses are also well represented in the area. A woody herb *Ludwigia hyssopifolia* and *Scoparia dulcis* has the highest frequency followed by, *Cynodon dactylon*, *Sphaeranthus indicus* and *Hygrophila schullii*. Herbaceous flora is dominating when compared with grass and sedges (Table 16).

Among the 39 species a grass *Cynodon dactylon* has the highest IVI value followed by *Ludwigia hyssopifolia*, *Scoparia dulcis*, *Sphaeranthus indicus* and *Sphaeranthus africana*. Among the flora 19 species with an IVI value less than one. The top 5 species in the IVI table forms more than 50 per cent of IVI value.

Table 16. Structural and compositional attributes of bund (Values in ha-1)

No.	Species	den	freq	rd	rf	ivi	Rivi
1	<i>Alternanthera sessilis</i>	500	5	0.1	0.69	0.79	0.4
2	<i>Ammannia baccifera</i>	0	5	0	0.69	0.69	0.35
3	<i>Anisochilus carnosus</i>	3500	5	0.67	0.69	1.36	0.68
4	<i>Azadiracta indica</i>	500	5	0.1	0.69	0.79	0.4
5	<i>Blumea oxydonta</i>	5500	10	1.05	1.38	2.43	1.22
6	<i>Cajanus cajan</i>	500	5	0.1	0.69	0.79	0.4
7	<i>Chamaesyce hirta</i>	3000	10	0.57	1.38	1.95	0.98
8	<i>Chromolaena odorata</i>	5000	35	0.95	4.83	5.78	2.89
9	<i>Coldenia procumbens</i>	18500	20	3.53	2.76	6.29	3.15
10	<i>Cyanotis axillaris</i>	4000	5	0.76	0.69	1.45	0.73
11	<i>Cynodon dactylon</i>	151500	55	28.91	7.59	36.5	18.25
12	<i>Cyperus compactus</i>	12500	20	2.39	2.76	5.15	2.58
13	<i>Cyperus cyperinus</i>	17500	20	3.34	2.76	6.1	3.05
14	<i>Eclipta prostrata</i>	28500	25	5.44	3.45	8.89	4.45
15	<i>Eragrostis unioloides</i>	0	5	0	0.69	0.69	0.35
16	<i>Eragrostis viscosa</i>	1500	5	0.29	0.69	0.98	0.49
17	<i>Hydrolea zeylanica</i>	4000	5	0.76	0.69	1.45	0.73
18	<i>Hygrophila schullii</i>	10500	35	2	4.83	6.83	3.42
19	<i>Hyptis suaveolens</i>	2500	15	0.48	2.07	2.55	1.28
20	<i>Ipomoea marginata</i>	1000	5	0.19	0.69	0.88	0.44
21	<i>Isachne globosa</i>	1000	5	0.19	0.69	0.88	0.44
22	<i>Ischaemum indicum</i>	4500	10	0.86	1.38	2.24	1.12
23	<i>Lantana camara</i>	1000	5	0.19	0.69	0.88	0.44

24	<i>Lindernia antipoda</i>	500	5	0.1	0.69	0.79	0.4
25	<i>Ludwigia hyssopifolia</i>	70500	85	13.45	11.72	25.17	12.59
26	<i>Marsilea minuta</i>	19000	25	3.63	3.45	7.08	3.54
27	<i>Mimosa pudica</i>	5500	15	1.05	2.07	3.12	1.56
28	<i>Mollugo pentaphylla</i>	11500	25	2.19	3.45	5.64	2.82
29	<i>Morinda pubescens</i>	1000	10	0.19	1.38	1.57	0.79
30	<i>Panicum repens</i>	2000	5	0.38	0.69	1.07	0.54
31	<i>Pennisetum polystachyon</i>	3000	5	0.57	0.69	1.26	0.63
32	<i>Sacciolepis interrupta</i>	3500	20	0.67	2.76	3.43	1.72
33	<i>Scoparia dulcis</i>	50000	85	9.54	11.72	21.26	10.63
34	<i>Sphaeranthus africana</i>	35500	25	6.77	3.45	10.22	5.11
35	<i>Sphaeranthus indicus</i>	33000	55	6.3	7.59	13.89	6.95
36	<i>Synedrella nodiflora</i>	1500	15	0.29	2.07	2.36	1.18
37	<i>Urena lobata</i>	2000	10	0.38	1.38	1.76	0.88
38	<i>Vernonia cinerea</i>	8000	20	1.53	2.76	4.29	2.15
39	<i>Xenostegia tridentata</i>	500	5	0.1	0.69	0.79	0.4
	TOTAL	524000	725	100	100	200	100

10. ANALYSIS AND DISCUSSION

In August 2008, Kerala State Biodiversity board has launched a natural agro-biodiversity restoration project in collaboration with the Erimayur Grama Panchayath, Agriculture Department, Padasekhara Samithy and local farmers of Padetti area of Palakkad District. The project was launched in a micro-watershed area of about 160 hectares in Padetti village of Erimayur, Palakkad. The main objective of the project was to demonstrate how the biodiversity can be restored, thus the ecological and environmental health of an agro-ecosystem could be enhanced by appropriate eco-friendly interventions.

During first phase of the floristic investigation, the entire Padetti micro-watershed areas were studied. Apart from the documentation of floristic diversity and various traditional systems related to agriculture, data regarding vegetal mosaics, community structure were also be generated during the study. Since the paddyfield are more sensitive to various agricultural practices, especially of chemical and organic, second phase exclusively examined the situation prevailed in this peculiar habitat. After a two year of time span, till the introduction of organic farming notable changes were observed in its environment. More over the approach of people towards an



eco-friendly culture is a positive benefit from this project. Revival of valuable traditional practices related to water management and fertilizer application is a part of that. Introduction of more Kokkarni's, organic vegetable production in their own homesteads, etc. are few examples. Most of the farmers in the area have small scale biofertiliser unit exclusively for their homesteads. During our survey, we witnessed various merits of organic farming directly from the farmers.

Now the farmers in Padetti extensively use organic manures and pesticides such as Cow dung, Vermicompost, Azospirillum, K-bacterium, P-bacterium, Neem cake, Castor cake, Panchagavyam, etc. Panchagavya the traditional method, used to safeguard plants and soil micro-organisms leads to increase plant production. Farmers in the area witnessed

the profitability of Panchagavya against the recommended chemical applications. The modified versions of Panchagavya are also used for organic farming. Some other organic pesticides used in the area are Anjila kashayam, which is sprayed to control worm attacks. A preparation made from neem oil, garlic and bar soap is also used to control insect attacks. For controlling insects, they plant Chrysanthemum, Marigold etc. along the bunds. These plants attract and kill the insects and pests. For improving soil fertility they cultivate legumes such as Phaseolus and Cajanus along the bunds also in paddyfields during offseason. At times, they cultivate other soil-friendly short duration crop in their paddyfields. All these practices help to increase soil health, also for controlling the pests and insects. In chemical farming area they are extensively using fertilisers such as Factamphos, Potash, Urea, etc. and pesticides such as Dodine, Ecalex, Fenwal, Nuvacron, etc.

Farmers in Padetti cultivate rice varieties such as Aiswarya, Jyothi which are of 120 days duration and Uma which need 140 days duration for the growth and harvest. Till the introduction of organic farming, the farmers in the area intensified the traditional water conservation techniques. Along with the water

from Malampuzha irrigation project they are now managing the drought scenario to a certain extent. About 50 acres of paddy fields are irrigated by Malampuzha water and the rest 50 depends on Kokkarni's.

Floristic community of paddyfields are unique and sensitive to external interference and soil quality. The natural flora of Paddy fields are mainly composed of sedges and grasses. Due to the continuous disturbances in paddyfields through weed management and cultivation, vegetal structure may change from time to time. It shows structural and compositional dynamics based on season also. During the first phase, a total of 465 species were recorded from the entire area, including the forest. In the second phase around 40 percent of the flora were recorded from the paddyfield and adjacent organic homesteads only. In the previous study 173 species of higher plants were recorded from paddy field, however during the second phase a total of 202 species were recorded. It shows a gradual increase in the diversity. More over there is an increase of habitat specific, narrow spectrum indigenous species and decrease of widely distributed broad spectrum species.

For analysing the seasonal vegetal structure, two seasons such as Post-harvest and pre-harvest, each with chemical and organic systems were studied. With regard to post-harvest and pre-harvest scenario, post-harvest season-May showed higher diversity than pre-harvest season-September, this may due to undisturbed post session of paddy harvest. A total of 91 species were recorded from the pre-harvest season when compared to 163 species during post-harvest season. In general post-harvest season have higher number of woody forms and perennial items. In pre-harvest period organic farming area have higher diversity than chemical farming area. A total of 63 species were recorded from the organic farming area against the 56 species from chemical farming area. Paddy field in the organic farming area recorded 29 species and bund with 48 species against the 30 species in paddy field and 44 species in bunds of chemical farming area. Data shows higher diversity in organic farming area. Structural and compositional data in both the system



showed that weeds like *Sacciolepis interrupta* and grasses like *Ischaemum* and *Digitaria* sedge like *Cyperus* have higher density, frequency and IVI values in chemical farming area. All are broad spectrum widely distributed species sometimes termed as weeds. In organic farming area habitat specific, narrow spectrum plants like *Ludwigia*, *Fimbristylis* etc. are dominating along with habitat sensitive species such as *Dopatrium*, *Eriocaulon*, etc. though their density is low.

A total 166 species were recorded during the post-harvest season, homesteads have higher contribution in diversity with large number of invasive species, paddy system showed higher diversity with lower number of weeds. A total of 82 species were recorded from the organic farming area against 48 species in the chemical farming area during this season. Large variation is observed in the diversity of paddyfield and bunds, paddyfield in the organic farming area with 41 species and bunds with 60 species against the 25 species in paddy fields

and 39 species in bunds of chemical farming area. Higher number in bunds is due to the undisturbed natural growth when compared to paddy field. Structural and compositional data also shows the same pattern as seen during pre-harvest season with large variation in diversity and density of indigenous narrow spectrum species. It is also noted that in many of the sample plots in organic farming area, percentage of site specific medicinal plants are high when compared to the weeds like *Sacciolepis interrupta*, *Cyperus compactus*, *Cyperus cyperinus*, etc. Since the response of plants, when compared to amphibians, worms, molluscs, etc. are slow against the changes in soil and environment, the results lights on the serious issues related to chemical applications in soil and environment, apart from its hazardous effect on human beings.

Padetti might have a few lessons for other areas of Palakkad or Kerala. Nevertheless, a good part of that might be the renewal of the lessons from the past.

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