Agriculture provides a concentrated and easily available source of food to birds. About 50 genera of birds representing 132 species and 234 sub species are reported to depredate on various agricultural crops in India. Total of 453 species of birds belonging to 65 families have been listed from Gujarat state, recent record is 494 species. Out of 8630 species of birds in the world, about 1284 species belonging to 75 families and 20 orders are recorded in India. About 96 genera of birds representing 42 families and 141 species were found on various agricultural crops and surrounding study area of Patan district. Survey of literature collected by Agrawal and Bhatnagar and Dhindsa and Saini on problem birds in agriculture suggest that the Rose ringed Parakeet (*Psittacula krameri*), House Crow (*Corvus splendens*), Blue rock Pigeon (*Columba livia*), Ring Dove (*Streptopelia decaocto*) and House sparrow (*Passer domesticus*) are amongst the bird species damaging crop and stored grains. Insectivores birds are good biological control agent in reducing insect pest population. Agricultural crop field attract many birds from sowing to ripening stage. This paper presents the structure of bird community and their economic status in agroecosystem.

**MATERIAL AND METHODS**

Anand district is located in central part of Gujarat state. It is located at 72.15° to 73.18° East longitude and 22.07° to 23.29° north latitude. The survey of bird fauna was conducted during 2012-14 in 8 talukas of Anand district and 2 sites from each taluka was selected for the study purpose and various bird species were recorded. Birds were identified with the help of standard book and counted by using binocular (8 X 40).

Observations were taken twice or thrice a week, each crop field is chosen for observation of one hour duration. The number of insect pest and bird species were recorded. Their economic status whether useful or harmful or facultative assessed by observing through food taken by birds in the field.

**RESULTS AND DISCUSSION**

In the present study the birds found in agro ecosystem were classified into three broad groups according to their feeding habit (Table-1).

**Useful bird:** Feeding on insects, rats etc.

**Harmful birds:** Depredating on grains, vegetables and fruits.

**Facultative birds:** Food habit changes according to its availability.

The results of the present study (Table-1), indicate that the majority of birds were useful (57 species: 61.29%) followed by facultative (27 species: 29.03%) and minimum number of harmful species (09 species: 9.67%) (Fig.-1). In India, 26 species of birds have been reported to prey on insect pests of agricultural crops while Bhalodiya *et al.* found 10 bird species feeding on crops in Morzar village. The birds and the food present at particular habitat called feeding guilds. The thing on which bird feed is known as feeding habits. A total 93 bird species were observed for above purpose. Among the birds observed in rice fields insectivores were the dominant group followed by soil invertebrate feeders and
Table 1: Bird species associated with agro ecosystem and their economic status

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>New English Name</th>
<th>Scientific Name</th>
<th>Feeding Habit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Indian Pond Heron</td>
<td>Ardeola grayi</td>
<td>In</td>
</tr>
<tr>
<td>2.</td>
<td>Purple Heron</td>
<td>Ardea purpurea</td>
<td>In</td>
</tr>
<tr>
<td>3.</td>
<td>Cattle Egret</td>
<td>Bubulaeus ibis</td>
<td>In</td>
</tr>
<tr>
<td>4.</td>
<td>Little Egret</td>
<td>Egretta garzetta</td>
<td>In</td>
</tr>
<tr>
<td>5.</td>
<td>Great Egret</td>
<td>Ardea alba (Casmerodius albus)</td>
<td>In</td>
</tr>
<tr>
<td>6.</td>
<td>Median Egret</td>
<td>Egretta garzetta</td>
<td>In</td>
</tr>
<tr>
<td>7.</td>
<td>Black Ibis</td>
<td>Pseudibis papillosa</td>
<td>In</td>
</tr>
<tr>
<td>8.</td>
<td>Glossy Ibis</td>
<td>Plegadis falcinellius</td>
<td>In</td>
</tr>
<tr>
<td>9.</td>
<td>Oriental White Ibis</td>
<td>Theskiornis melanocephalus</td>
<td>In</td>
</tr>
<tr>
<td>10.</td>
<td>Grey Francolin</td>
<td>Francolinus pondicerianus</td>
<td>In/C</td>
</tr>
<tr>
<td>11.</td>
<td>Common Quail</td>
<td>Columbix coturnix</td>
<td>In</td>
</tr>
<tr>
<td>12.</td>
<td>Indian Peafowl</td>
<td>Pavo cristatus</td>
<td>In/C/V</td>
</tr>
<tr>
<td>13.</td>
<td>White Breasted Waterhen</td>
<td>Amaurornis phoenicurus</td>
<td>In</td>
</tr>
<tr>
<td>14.</td>
<td>Common Moorhen</td>
<td>Gallinula chloropus</td>
<td>In</td>
</tr>
<tr>
<td>15.</td>
<td>Purple Moorhen</td>
<td>Porphyrocephalus porphyrocephalus</td>
<td>In</td>
</tr>
<tr>
<td>16.</td>
<td>Sarus Crane</td>
<td>Grus antigone</td>
<td>In/C</td>
</tr>
<tr>
<td>17.</td>
<td>Red-wattled Lapwing</td>
<td>Vanellus indicus</td>
<td>In/C/P</td>
</tr>
<tr>
<td>18.</td>
<td>Blue Rock Pigeon</td>
<td>Columba livia</td>
<td>In/C/P/S</td>
</tr>
<tr>
<td>19.</td>
<td>Yellow-legged Green Pigeon</td>
<td>Treron phoenicoptera</td>
<td>F/C/I</td>
</tr>
<tr>
<td>20.</td>
<td>Oriental turtle dove</td>
<td>Streptopelia orientalis</td>
<td>C/W</td>
</tr>
<tr>
<td>21.</td>
<td>Eurasian Collared Dove</td>
<td>Streptopelia decaocto</td>
<td>C/W</td>
</tr>
<tr>
<td>22.</td>
<td>Red collared Dove</td>
<td>Streptopelia tranquebarica</td>
<td>C/W</td>
</tr>
<tr>
<td>23.</td>
<td>Spotted Dove</td>
<td>Streptopelia chinensis</td>
<td>C/W</td>
</tr>
<tr>
<td>24.</td>
<td>Laughing dove</td>
<td>Stilopolia senegalensis</td>
<td>C/W</td>
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<tr>
<td>25.</td>
<td>Rose-ringed Parakeet</td>
<td>Psittacula krameri</td>
<td>C/O/S/P/F/W/I</td>
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<tr>
<td>26.</td>
<td>Asian Koel</td>
<td>Eudynamys scolopacae</td>
<td>In/F</td>
</tr>
<tr>
<td>27.</td>
<td>Pied Crested Cuckoo</td>
<td>Clamator jacobinus</td>
<td>In/F</td>
</tr>
<tr>
<td>28.</td>
<td>Greater coucal</td>
<td>Centropus sinensis</td>
<td>In/W</td>
</tr>
<tr>
<td>29.</td>
<td>White Breasted - Kingfisher</td>
<td>Halcyon smyrniasis</td>
<td>In</td>
</tr>
<tr>
<td>30.</td>
<td>Lesser Pied Kingfisher</td>
<td>Ceryle rudis</td>
<td>In</td>
</tr>
<tr>
<td>31.</td>
<td>Common Kingfisher</td>
<td>Alcedo atthis</td>
<td>In</td>
</tr>
<tr>
<td>32.</td>
<td>Blue-checked Bee-eater</td>
<td>Merops persicus</td>
<td>In/C/F</td>
</tr>
<tr>
<td>33.</td>
<td>Small Bee-eater</td>
<td>Merops orientalis</td>
<td>In/C</td>
</tr>
<tr>
<td>34.</td>
<td>Indian Roller</td>
<td>Coracias benghalensis</td>
<td>In</td>
</tr>
<tr>
<td>35.</td>
<td>Common Hoopoe</td>
<td>Upupa epops</td>
<td>In/C</td>
</tr>
<tr>
<td>36.</td>
<td>Coppersmith Barbet</td>
<td>Megalaima haemacephala</td>
<td>In</td>
</tr>
<tr>
<td>37.</td>
<td>Ashy-crowned Sparrow Lark</td>
<td>Eremopterix grisea</td>
<td>C/In/W</td>
</tr>
<tr>
<td>38.</td>
<td>Rufous-tailed Lark</td>
<td>Ammomanes phoenicu</td>
<td>In/C/W</td>
</tr>
<tr>
<td>39.</td>
<td>Wire-tailed Swallow</td>
<td>Hirundo smithii</td>
<td>In</td>
</tr>
<tr>
<td>40.</td>
<td>Rufous-backed Shrike</td>
<td>Lanius schach</td>
<td>In</td>
</tr>
<tr>
<td>41.</td>
<td>Bay-backed Shrike</td>
<td>Lanius vittatus</td>
<td>In</td>
</tr>
<tr>
<td>42.</td>
<td>Southern Grey Shrike</td>
<td>Lanius excubitor(orientalis)</td>
<td>In</td>
</tr>
<tr>
<td>43.</td>
<td>Eurasian Golden Oriole</td>
<td>Oriolus oriolus</td>
<td>In/F</td>
</tr>
<tr>
<td>44.</td>
<td>Black Drongo</td>
<td>Dicrurus macrocercus</td>
<td>In</td>
</tr>
<tr>
<td>45.</td>
<td>White bellied drongo</td>
<td>Dicrurus caerulescens</td>
<td>In</td>
</tr>
<tr>
<td>46.</td>
<td>Common Myna</td>
<td>Acridotheres tristis</td>
<td>In/F</td>
</tr>
<tr>
<td>47.</td>
<td>Bank Myna</td>
<td>Acridotheres gilliganus</td>
<td>In/C/F</td>
</tr>
<tr>
<td>48.</td>
<td>Brahminy Starling</td>
<td>Sturnus pagodarum</td>
<td>In/C/F</td>
</tr>
<tr>
<td>49.</td>
<td>Rosy Starling</td>
<td>Sturnus roseus</td>
<td>In/C/F</td>
</tr>
<tr>
<td>50.</td>
<td>House Crow</td>
<td>Corvus splendens</td>
<td>In/C/O/S/F/P</td>
</tr>
<tr>
<td>51.</td>
<td>Jungle Crow</td>
<td>C. macrocephalus c. macrorhynchos</td>
<td>In/C/O/S/F/P</td>
</tr>
<tr>
<td>52.</td>
<td>Indian Tree pie</td>
<td>Dendrocitta vagabunda</td>
<td>In</td>
</tr>
<tr>
<td>53.</td>
<td>White Brown Fantail</td>
<td>Rhipidura aureola</td>
<td>In</td>
</tr>
<tr>
<td>54.</td>
<td>White Throated Fantail</td>
<td>Rhipidura albicollis</td>
<td>In</td>
</tr>
<tr>
<td>55.</td>
<td>Large Cuckoo-Shrike</td>
<td>Coracina macellina</td>
<td>In</td>
</tr>
<tr>
<td>56.</td>
<td>Black-headed Cuckoo-Shrike</td>
<td>C. melanoptera</td>
<td>In</td>
</tr>
</tbody>
</table>

CONTD...
**Fig.- 1: Relative occurrence of bird species based on food habit**

<table>
<thead>
<tr>
<th>Common wood shrike</th>
<th>Tephrodornis pondicerianus</th>
<th>In</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Minivet</td>
<td>Pericrocotus cinnamomeus</td>
<td>In</td>
</tr>
<tr>
<td>Common Iora</td>
<td>Aegithina tephia</td>
<td>In</td>
</tr>
<tr>
<td>Marshall's Iora</td>
<td>Aegithina nigralutea</td>
<td>In</td>
</tr>
<tr>
<td>Red-vented Bulbul</td>
<td>Pyconotus cafer</td>
<td>In/C/P/F</td>
</tr>
<tr>
<td>White Browed Bulbul</td>
<td>Pyconotus fuscus</td>
<td>In</td>
</tr>
<tr>
<td>White eared Bulbul</td>
<td>Pyconotus leucotis</td>
<td>In</td>
</tr>
<tr>
<td>Jungle Babbler</td>
<td>Turdoides striatus</td>
<td>In/C/P/F</td>
</tr>
<tr>
<td>Common Babbler</td>
<td>Turdoides caudatus</td>
<td>In/C/P/F</td>
</tr>
<tr>
<td>Yellow-eyed Babbler</td>
<td>Chrysomma sinense</td>
<td>In/C/F</td>
</tr>
<tr>
<td>Large Grey Babbler</td>
<td>Turdoides malcolmi</td>
<td>In/C</td>
</tr>
<tr>
<td>Common Chiffchaff</td>
<td>Phylloscopus collybita</td>
<td>In</td>
</tr>
<tr>
<td>Common Tailorbird</td>
<td>Orthotomus sutorius</td>
<td>In</td>
</tr>
<tr>
<td>Indian Robin</td>
<td>Saxicolaides fulicata</td>
<td>In</td>
</tr>
<tr>
<td>Oriental Magpie Robin</td>
<td>Copsychus saularis</td>
<td>In</td>
</tr>
<tr>
<td>Blue throat</td>
<td>Luscinia svecica</td>
<td>In</td>
</tr>
<tr>
<td>Clamorous Reed Warbler</td>
<td>Acrocephalus stentoreus</td>
<td>In</td>
</tr>
<tr>
<td>Red-breasted Flycatcher</td>
<td>Ficedula parva</td>
<td>In</td>
</tr>
<tr>
<td>Common Stonechat</td>
<td>Saxicola torquatus</td>
<td>In</td>
</tr>
<tr>
<td>Isabelline Wheatear</td>
<td>Oenanthe isabellina</td>
<td>In</td>
</tr>
<tr>
<td>Black Red start</td>
<td>Phoenicurus ochruros</td>
<td>In</td>
</tr>
<tr>
<td>Pied Bushchat</td>
<td>Saxicola caprata</td>
<td>In</td>
</tr>
<tr>
<td>Paddy-field Pipit</td>
<td>Anthus rufulus</td>
<td>In/C</td>
</tr>
<tr>
<td>White Wagtail</td>
<td>Motacilla alba</td>
<td>In/C</td>
</tr>
<tr>
<td>Yellow Wagtail</td>
<td>Motacilla flava</td>
<td>In/C</td>
</tr>
<tr>
<td>Citrine wagtail</td>
<td>Motacilla citreola</td>
<td>In</td>
</tr>
<tr>
<td>Ashy Prinia</td>
<td>Prinia socialis</td>
<td>In</td>
</tr>
<tr>
<td>Grey Breasted Prinia</td>
<td>Prinia hodgsonni</td>
<td>In</td>
</tr>
<tr>
<td>Plain Prinia</td>
<td>Prinia inornata</td>
<td>In</td>
</tr>
<tr>
<td>Jungle Prinia</td>
<td>Prinia sylvatica</td>
<td>In</td>
</tr>
<tr>
<td>Purple Sunbird</td>
<td>Noctarhina asiatica</td>
<td>In</td>
</tr>
<tr>
<td>Oriental White-eye</td>
<td>Zosteropus palpebrosus</td>
<td>In</td>
</tr>
<tr>
<td>House Sparrow</td>
<td>Passer domesticus</td>
<td>In</td>
</tr>
<tr>
<td>Chestnut-shouldered Petronia</td>
<td>Gymnoris xanthocolia</td>
<td>In</td>
</tr>
<tr>
<td>Baya Weaver</td>
<td>Ploceus philippinus</td>
<td>In/C</td>
</tr>
<tr>
<td>White-throated Munia</td>
<td>Lonchura malabarica</td>
<td>In/C/W</td>
</tr>
<tr>
<td>Spotted munia</td>
<td>Lonchura punctulata</td>
<td>In/C/W</td>
</tr>
</tbody>
</table>

**Description of abbreviations:** Food Habit: C - Cereals; Os - Oil seeds; V - Vegetables; In - Insects; F - Fruits; P - Pulses.

All the observed birds were mostly facultative, insectivores and granivorous. Blue rock Pigeon, Grey Francolin, Baya weaver, Rose ringed Parakeet etc. are granivorous birds; they damaged sown seeds of sesamum, sorghum and pearl millet. Indian pea fowl was observed feeding on tender leaves and flowers of cucumber, black gram and cotton. Rose ringed Parakeet was observed feeding on fruits, chilli and millet crops. Baya weaver bird played dual role as they are feeding on larvae of insects of different crops but this done for nest construction⁴.
Ten bird species were found feeding on the white grub exposed during ploughing operation.

REFERENCES