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INTERVENTIONIST APPROACH TO ENVIRONMENT CONSERVATION THROUGH PROMOTING BUTTERFLY FARMING IN THE GREAT GANGETIC PLAIN

Manbeer Kaur

Assistant Professor, Department of Zoology

B.A.M.Khalsa College Garhshankar, District Hoshiarpur, Punjab, India

ABSTRACT

Innovative strategies for environment conservation are the clarion call for environmentalists, botanists, zoologists and scientists from various allied fields. Butterfly farming has caught the fancy of many of the newer experiementative steps being taken to reclaim the lost bounty of a fast depleting Nature resource.

Over the last 15 years, the number of commercial butterfly farms has grown and exposure on the internet connects butterfly raisers and buyers. People are thrilled to discover they can purchase live butterflies to release at any special event. They are also purchased for special fund raisers, and community events.

A butterfly farmer must provide the correct host plant to provide feed for the growing larvae. Space, equipment, time and labor besides a place to breed or mate are essentialities for the "gravid" females. They may need a place or a container to lay their eggs alongwith a place set up for larvae to eat and grow.

A butterfly farmer, helped by a knowledgeable entomological expert must have flexibility, patience, determination, and be willing to work hard to learn the business, promote and expand it. This paper studies the opportunities available, the reasons why they have not been accessed by Indian farmers as also the approach to be utilized to popularize this innovative intervention towards environmental conservation in the Great Gangetic Plain.

Key Words :Butterfly Farming , Community Participative , Conservation , Environment , Zoological Interventions.

I. INTRODUCTION

1.1. An Interventionist Approach

Einstein had said that it would take mankind just ten years to die if all the bees were to disappear or were somehow killed. This seemed to be a voice from the past cautioning humanity to awaken to its mistakes – the mistakes made when mankind challenged, played with and threatened the laws of Nature. The above statement goes to show what a delicate balance has been maintained by the environment in which we live. The flora and fauna all over the world have been destroyed unwittingly by unscrupulous agents of commerce who in the name

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of development ignored all the rules of replenishment and reestablishment of the natural environment. The original rich resources have been depleted by the footprint of unscrupulous infrastructural progress and utilization of non-renewable natural fuels.

While looking at the alterative available it is the developing would that has come up with the innovative interventions for ameliorating the situation and creating a series of interventions for the reclamation of Natures bounty. One of the interventions that is fast picking up pace is the aspect of butterfly farming. It has been seen as a community intensive intervention that can promote the conservation of the environment and also promote the sustainable income generation for rural and indigenously oriented people. Most tropical countries have experimented with this new intervention and have taken it to several scales of success. Some of the countries that have seen successive manifestation of the fruitful results of this interventional strategy are the Philippines, Costa Rice, Uganda, Tanzania and Kenya.

The gradual depletion of the forest cover, the unmitigated exploitation of natural non-renewable energy sources and the indiscriminate utilization of the Earth's green bountyall have posed a continued threat to several species, some of which have even become extinct. While developed nations have sullied the global surface with their carbon foot-prints the developing nations have successively stepped forward to take up the case of reclamation of the world environment. Many a times these are innovative interventions that tend to have some extent of fall out or have some side-effects; however, butterfly farming has been known to have no side effects at all. The butterflies are reared separately and not captured from the wild. This ensures that the butterflies in the wild were not endangered in any way at all by disease debilitation or diminishing numbers.

The butterflies are Nature's mobile spectrum flittering across gardens, parks, wooded areas and vegetables patches. They are secular and unbiased. A large variety of plants are their host plants for laying, for eating the leaves of, as caterpillars and to hang from as pupae. These butterflies tend to appeal to infants and elderly alike and this is the reason that the rearing of butterflies has been put to excellent use.

1.2. Life History and Rearing

Many a butterfly rearer has started from a small window box and grown the business to a large poly house a flutter with the colourful winged creatures. It is hard to put them down as insects even though they own placement in the animal and plant kingdoms it is a few rare species like the butterfly who create the much needed bridge between the two variant kingdoms.

Every aspect of a butterfly is splendid amazing manifestation of Nature. Yet the most amazing part of its life is the transformation it undergoes from the stage of an egg to the full of life fully-bloomed butterfly. This transformation is called metamorphosis. This Metamorphosis is a remarkable phenomenon of Nature. It is the process of change stimulating the transformation from egg to larval stage and from larva to pupa or the cocoon stage and thereon from which emerges a virtual work of art wrought by Nature, that is the lovely butterfly. Itis considered one of the most remarkable phenomenae of nature.

The following steps of Metamorphosis involve four stages:

1.2.1. **Egg:** The female butterfly lays eggs on the underside of the leaves of specific plants so that when the caterpillars later emerge from the eggs, they can immediately get food from the plant leaves.

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1.2.2. **Larva:** They are called caterpillars and emerge from the eggs after a few days. The caterpillar is a voracious eater and spends most of its time eating. This makes the caterpillar grow with unprecedented speed. After eating continuously the caterpillar reaches a stage where it can eat no more. This stage is called the pupal stage.

1.2.3. **Pupa:** is when the caterpillar stops eating and finishes growing. It forms a protective shield. Most of the magical transformation into a butterfly takes place inside the Pupa around the Pupa. The larva sits quietly and bides it time till it has grown wings. The butterfly cannot fly immediately as its winger are still wet. After drying them in the sun

II. FEEDING HABITS AND HOST PLANTS

For perpetuation of these butterfly farms all along the GreatGangetic plain it is essential to understand their feeding habits, the host plants that nurture them as well as those that provide nectar, shelter for their eggs as well as serve as feeding grounds for their larvae. A select list of host plants in presented herewith.

Table 1: List of Nectar Food Plantsfor butterflies in the Great Gangetic Plain

S.No.	Name of the taxa	Name of nectar food plant/s
1	*Castalius rosimon* (Fabricius)	*Vicoa auriculata Cass.* (Compositae) ,*Sida acuta* (Burm.f.) (Malvaceae), *Lantana camara* Linnaeus (Verbenaceae), *Oxalis sp.* (Oxalidaceae) *Ageratum conyzoides* Linnaeus (Compositae), *Tridax procumbens* Linnaeus (Compositae)
2.	*Euchrysops cnejus* (Fabricius)	*Boerhavia diffusa* Linnaeus(Nyctaginaeae), *Sida acuta (*Burm.f.) (Malvaceae), *Vigna unguiculata* Linnaeus (Legumnosae), *Tridax procumbens* Linnaeus (Compositae), *Milletia ovalifolia* Kurz. (Legumnosae).
3.	*Vanessa (Aglais) cashmiriensis* Kollar	*Verbena bonariensis* Linnaeus (Verbenaceae), *Lantana camara* Linnaeus (Verbenaceae), *Prunus bokharensis*(Schau.) (Rosaceae), *Tagetes erecta* (Linnaeus) (Compositae),
4.	*Vanessa (Vanessa) indica* (Herbst)	*Tridax procumbens* Linnaeus (Compositae), *Tagetes erecta* (Linnaeus) (Compositae), *Verbena bonariensis* Linnaeus (Verbenaceae), *Prunus bokharensis*(Schau.) (Rosaceae).
5.	*Vanessa (Cynthia) cardui* (Linnaeus)	*Verbena bonariensis* Linnaeus (Verbenaceae), *Tridax procumbens* Linnaeus (Compositae), *Petunia hybrid* (Hook) (Solanaceae) ,*Limonium sinuatum* Linnaeus (Plumbaginaceae), *Lantana camara* Linnaeus (Verbenaceae).
6.	*Hypolimnas bolina* (Linnaeus)	*Lantana camara* Linnaeus (Verbenaceae), *Ageratum conyzoides* Linnaeus (Compositae), *Tagetes erecta* Linnaeus (Compositae) *Alstonia scholaris* (Linnaeus) (Apocynaceae).

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7.	*Junonia almana* (Linnaeus)	*Lantana camara* Linnaeus (Verbenaceae), *Alstonia scholaris* (Linnaeus) (Apocynaceae), *Solidago Canadensis* (Linnaeus) (Compositae), *Tagetas erecta*(Linnaeus) (Compositae).
8.	*Phalanta phalantha* (Drury)	*Cosmos sulphurous* Cav. (Compositae),*Sida rhombifolia*Linnaeus (Malvaceae), *Lantana camara* Linnaeus (Verbenaceae), *Alstonia scholaris (Linnaeus) (Apocynaceae), Verbena bonariensis* Linnaeus (Verbenaceae).
9.	*Acraea issoria* (Hiibner)	*Erigeron* sp. (Compositae), *Verbena bonoriensis* Linnaeus (Verbenaceae).
10	*Acraea terpsicore* (Linnaeus)	*Bidens pilosa* Linnaeus (Compositae),*Tridax procumbens* Linnaeus (Compositae).
11.	*Ypthima inica* Hewitson	*Tagetes erecta* (Linnaeus) (Compositae),*Vernonia cinerea* Linnaeus (Compositae) ,*Cnicus arvensis* Hoffman (Compositae), *Momodica charantia* Linnaeus (Cruciferae) *Sida rhombifolia* Linnaeus (Malvaceae).
12.	*Euploea core* (Cramer)	*Ageratum conyzoides* Linnaeus (Compositae), *Lantana camara* Linnaeus (Verbenaceae), *Alstonia scholaris* Linnaeus (Apocyanaceae) *Tagetes erecta* (Linnaeus) (Compositae).
13	*Colotis amata* (Fabricius)	*Lantana camara* Linnaeus (Verbenaceae), *Tagetes erecta* Linnaeus (Compositae).
14.	*Pontia daplidice* (Linnaeus)	*Lantana camara* Linnaeus (Verbenaceae), *Murraya koenigii* (Linnaeus) (Rutaceae) ,*Verbena bonariensis* Linnaeus (Verbenaceae) ,*Tageteserecta*(Linnaeus) (Compositae), *Brassica* sp. (Cruciferae)
15.	*Cepora nerissa* (Fabricius)	*Lantana camara*Linnaeus (Verbenaceae) *Carissa spinarum*Linnaeus(Apocynaceae) *Bidenspilosa*Linnaeus (Compositae) *Murrayakoenigii*(Linnaeus) (Rutaceae) *Verbena* sp.

Source: Unpublished PhD Thesis of Manbeer Kaur

These plants can be found from the region encompassing the lower Shiwalik's to the several banksides of the tributaries and distributaries of the Great Gangetic Plain. As this a fertile region it has been harnessed for the cultivation of several food grain bearing flora as well as innumerable variety of vegetable and fruit bearing plants. The food grains range from wheat and rice to a large variety of pulses and spice as well as legumes like peas and groundnuts. The numbers of vegetables too are quite popular with butterflies like the inconsequential while cabbage and cauliflower butterfly.

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Table 2: Butterfly species and their larval host plant species[1]

Sr. No.	Name of Family and species of order Lepidoptera	Host Plant species used for egg laying or harbouring larva
	Family Danaidae	
1	*Danaus (Anosia) Chrysippus*(Linnaeus)	*Calotropis procera* (Ait.) (Asclepiadaceae), *Trifoloum alexandrum* Linn. (Papilionaceae)
2	*Euploea core* (Cramer)	Ichnocarpus frutescens R. Br (Apocynaceae)
	Family Hesperiidae	
3	*Pelopidas mathias mathias* (Fabricius)	*Oryza satvia* Linn (Gramineae)
4	*Spiala galba* (Fabricius)	*Sida rhombifolia* (Linn) var, *obovata* Mast (Malvacae)
	Family : Lycaenidae	
5	*Tarucus alteratus* Moore	*Zizyphus mauritiana* Lamk *Z. jujube* Lamk (Rhamnaceae)
6	*Tarucus hazara* Evans	*Z. mauritiana* Lamk (Rhamnaceae)
7	*Tarucus indica* Evan	*Z. jujube* Lamk (Rhamnaceae)
8.	*Taracus callinara* (Moore)	*Zizyphus mauritiana* Lamk (Rhamnaceae)
9	*Tarucus balkanicus* (Freyer)	*Z. jujube* Lamk (Rhamnaceae)
10	*Chilades lajus lajus* (Cramer)	*Citrus aurantiifolia* (Cristim) *C. limettioides tanaka* and *C. sinensis* Linn (Rutaceae)
11	*Zizeeria karsandra* (Moore)	*Chenopodium album* Linn *C. murale* Linn (Chenopodiaceae)
12	*Lampides boeticus* (Linn)	*Butea monosperma* (Dhak)(Lamk) *Pisum sativum* (Linn) *Cajanus cajan* (Linn), *C.rotalaria* and *Vicia faba* Linn (Papilionaceae)
13	*Freyeria putli* (Kollar)	*Tribulus terrestris* (Linn) (Zigophyllaceae) *Alysicarpus monlifer* DC (Papilionaceae)
14	*Pseudozizeeria maha* (kollar)	*T. alexandrum* (Papilionaceae) *Oxalis comiculata* (Linn) (Oxalidaceae)
15	*Spindasis vulacanus* (Fabricius)	*Clerodendrum increme* (Linneaus) (Verbenaceae)
16	*Rapala airbus* (Fabricius)	*Albizzia lebbeck* (Linneaus) (Mimosaceae)
17	*Azanus ubaldus* (Cramer)	*Acacia leucophlea* (Roxb.) (Jand) (Mimosaceae)
18	*Castalius rosimon* (Fabricius)	*Zizyphus oenoplia* (L) Mill (Rhamanceae)

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19	*Euchrysops cnejus* (Fabricius)	*Milletia ovalifolia* Kurz *Pongamia pinnata* Linnaeus *Phaseolus aconifolius* Jacquin *Cassia occidentalis* Linnaeus *Dalichos lab lab* (Linneaus) (Leguminosae) *Albizzia lebbeck* (Linneasus) (Mimosaceae)
20	*Leptotes plinius* (Fabricius)	*Albizzia lebbeck* (Linnaeus) (Mimosaceae)
	Family Nymphalidae	
21	*Junonia orithyia* (Linnaeus)	*Antrirhinum majus* Linn. (Scrophulariaceae)
22	*J. hierta* (Fabricius)	*Barleria cristata* Linn. ,*Ruellia britoniana* Leonard(Acanthaceae)
23	*J. almana* (Linnaeus)	*Lippia nodiflora* A. Rich. F. (verbenacae)
24	*Vanessa (Aglais) cashmiriensis* Kollar	*Urtica dioica* Linnaeus (Urticaceae)
25	*Vanessa (Vanessa) indica* (Herbst)	*Urtica dioica* Linnaeus (Urticaceae)
26	*Vanessa (Cynthia) Cardui* (Linnaeus)	*Cincus wallihi* Hook. F. *Cincus avensis* Hoffnicin (Compositae) *Malva sylvestris* Linnaeus *Althaea rosea* (Linnaeus) (Malvaceae)
27	*Hypolimnas bolina* (Linnaeus)	*Xanthium strumarium* Linn (Compositae)
28	*Ariadne merione* (Linneaeus)	*Ricinus communis* Linn (Euphorbiaceae)
29	*Phalanta phalantha* (Drury)	*Flacourtia indica* (Burm. F) (Flacourtiacea) *Populus deltodis* Linnaeus (Salicaeae)
30	*Acraea issoria* (Hubner)	*Debregeasia hypoleuca* Wedd, (Urticaceae)
31	*Acraes terpsicore* (Linnaeus)	*Ionidium heterophytum* Vent. *Viola tricolor* Linnaeus (Violaceae)
32	*Ypthima inica* Hewitson	*Cynodon dactylon* (Linnaeus) (Graimaceae)
	Family Papilionidae	
33	*Paplio (Princeps) demoleus* (Linnaeus)	*Citrus. aurantifolia, C. limetioides* and *C. sinensis* Linn, (Rutaceae)
34	*P. polytes* Linnaeus	*Citrus. aurantifolia, C. limetioides, C. sinensis* Linn, and *Aegle marmelos* (Linn) (Rutaceae)
	Family Pieridae	
35	*Pieris brassicae* (Linnaeus)	*Brassica rapa* (Linnaeus) Gray ,*Brassica aleracea* var. *capitata* Linn (Cabbage) *Brassica aleracea* var. *botrytis* Linn (Cauliflowers) *Raphanus sativus* Linnaeus (Cruciferae)
36	*Pieris (Artogeia) canidia* Sparrman	*Sisymbrium irio* Linn

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		Coronopus didymus (Linn) (Cruciferae)
37	*Catopsilia pomona pomona* (Fabricus)	*Cassia siamea* Lamk (Caesalpiniaceae)
38	*C. pyranthe* (Linnaeus)	*Cassia tora*, *C. fistuia* Linn, and *C. occidentalis* Linn. (Caesalpiniaceae)
39	*Eurema (Terias) haecabe* (Linnaeus)	*Perkinsonia aculeate* Linn (Caesalpinieceae); *Trifolium alexndrinum, Medicago polymorphe* Linn. (Papilionaceae); *Albizzia lebbeck* (Linn) (Mimosaceae); *Cassia tora, Tamarindus indica* Linn. *Delonix regia* (Boj) (Caesalpiniaceae) *Poinciana pulcherrima* Linnaeus
40	*Anaphaeis aurota* (Fabricius)	*Capparis sepiarie* Linn (Capparaceae)
41	*Ixais marianne* (Cramer)	*Capparis sepiarie* Linn (Capparaceae)
42	*Colotis amata* (Fabricius)	*Salvadora oleoides* Decne. (Salvodoraceae)
43	*Colotis vestalis* (Butler)	*Salvadora oleoides* Decne. (Salvodoraceae)
44	*Pontia daplidica*(Linnaeus)	*Lepidium sativum* Linnaus (Brassicaceae)
45	*Cepora nerissa*(Fabricius)	*Senebiera didyma* (Linnaeus) (Cruciferae) *Capparissepiana* Linnaeus (Capparidaceae)

III. SOME SIGNIFICANT FACTS ABOUT THE BUTTERFLY

3.1. There are a total of about 1,500,000 insect species in the modern world.

3.2. Out of these there are just about 200,000 species which belong to the phylum Lepidoptera (the group to which at most of the moths and butterflies belong). The life cycle of a butterfly is extremely short and lasts a mere 30 to 40 days

3.3. 15,000 species of butterflies(Holloway et al. 1992)[2]

3.4. An assorted 17, 050 of these species are butterflies of the17, 050 species observed

3.5. On a Worldwide scale India has 1501 of these species of butterflies(1400-1600 species of the butterflies dwell in different habitats (Evans, 1932;[3] Talbot, 1939,[4] 1947; Wynter-Blyth, 1957[5]; Haribal, 1992[6]; Vaishney, 1994[7])

3.6. 451 butterflies have been included in different schedules of the Wildlife (Protection) Act, 1972.

3.7. India's First Butterfly Park was set up as full-fledged butterfly park, Bangalore on November 25, 2006 to promote ecotourism. The Butterfly Park which is located near the Bannerghatta Zoo. It was set up at an initial cost of Rs. 50 millions. It covers an area of over 7.5 acres.

The centre of attraction of this park is its 10,000 sq. feet circular Conservatory. It has a polycarbonate roof which has on display more than 20 species of butterflies.

There is yet another that houses a museum. Here are displayed the four stages of the lifecycle of the butterfly – the egg, larva or caterpillar pupa or chrysalis and the adult.

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IV. WORLD BUTTERFLY FARMING INITIATIVES

Some of the Butterfly Park and Farming initiatives taken up all over the world have been listed region-wise in the following Tables:

Table 3: World Initiatives in Butterfly Farming

Sr. No.	Name of the Park	Country	Region
1	Bantimurung – Bulusaraung National Park,	Indonesia	South East Asia
2	Butterfly Conservatory Of Goa (4,000 sq ft (400 m^2) enclosure 12,000 sq ft (1,000 m^2) facility. NGO)	India	Asia
3	Butterfly garden, Kadoorie Farm and Botanic Garden	Hong Kong	South East Asia
4	Butterfly garden, Wetland Park,	Hong Kong	South East Asia
5	Butterfly house, Ocean Park	Hong Kong	South East Asia
6	Butterfly Park, Bannerghatta National Park, Bangalore (10,000 sqft circular enclosure)	India	Asia
7	Butterfly Park Bangladesh, Chittagong	Bangladesh	Asia
8	Butterfly safari Park, Thenmala, Kerala	India	Asia
9	Kuala Lumpur Butterfly Park, Kuala Lumpur,	Malaysia	South East Asia
10	Phuket Butterfly Garden & Insect World, Phuket	Thailand	South East Asia
11	Penang Butterfly Farm, Penang, (houses 5,000 butterflies of over 120 species)	Malaysia	South East Asia
12	Malacca Butterfly & Reptile Sanctuary, Ayer keroh, Malacca,	Malaysia	South East Asia
13	Simply Butterflies Conservation Center, Bilar, Bohol	Philippines	South East Asia
14	Singapore Zoological Gardens - The Fragile Forest Enclosure	Singapore	South East Asia
15	AlarisSchmetterlingspark, Sassnitz, Rugen,	Germany	Europe
16	Schmetterlingshaus, Mainau, Baden Württemberg,	Germany	Europe
17	The North Somerset Butterfly House, Weston-super-Mare	United Kingdom	Europe
18	Bordano Butterfly House, Friuli Venezia Giulia	Italy	Europe
19	Bornholm Butterfly Park, Bornholm	Denmark	Europe
20	Collodi Butterfly House, Tuscany	Italy	Europe
21	Butterfly Arc, Veneto	Italy	Europe
22	Butterfly Botania, University of Eastern Finland, Joensuu,	Finland	Europe
23	Butterfly Garden, Grevenmacher	Luxembourg	Europe
24	Golders Hill Park, London NW3	United Kingdom	Europe
25	London Butterfly House, London	United Kingdom	Europe
26	Magic of Life Butterfly House Rheidol Valley, Aberystwyth, Ceredigion, Wales,	United Kingdom	Europe
27	Mariposario de Benalmádena, Andalusia	Spain	Europe

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28	Oasidelle Farfalle di Milano, Lombardia	Italy	Europe
29	Passiflorahoeve, VlindertuinHarskamp,	Netherlands	Europe
30	Seaforde Gardens and Butterfly House, Seaforde, County Down,	Northern Ireland	Europe
31	Schmetterlinghaus, Vienna	Austria	Europe
32	Stratford Butterfly Farm, Stratford-upon-Avon, Warwickshire	United Kingdom	Europe
33	Straffan Butterfly Farm, Straffan, County Kildare,	Republic of Ireland	Europe
34	VlinderkasDiergaardeBlijdorp,	Rotterdam, Netherlands	Europe
35	VlindertuinDierenparkEmmen, Emmen	Netherlands	Europe
36	Vlindertuin, Knokke, (closed)	Belgium	Europe
37	Wrocławskie Zoo, Wrocław	Poland	Europe
38	Butterfly House, Praid	Romania	Europe
39	The Butterfly Farm, St Maarten/St Martin,	St Maarten St Martin	Americas
40	The Butterfly Farm, Aruba,	Aruba	Americas
41	La Marquesa Forest Park Butterfly House, Guaynabo,	Puerto Rico	Americas
42	Mariposario Chapultepec, Mexico City,	Mexico	Americas
43	Montreal Insectarium, Montreal, Quebec	Canada	Americas
44	Cambridge Butterfly Conservatory, Cambridge, Ontario	Canada	Americas
45	Niagara Parks Butterfly Conservatory, Niagara Falls, Ontario	Canada	Americas
46	Victoria Butterfly Gardens, Brentwood Bay, British Columbia	Canada	Americas
47	Newfoundland Insectarium, Deer Lake, Newfoundland and Labrador	Canada	Americas
48	Butterflies & Blooms, Baldwin, Georgina, Ontario	Canada	Americas
49	Academy of Natural Sciences of Drexel University, Philadelphia	United States	Americas
50	Ashland Nature Center Butterfly House, Delaware Nature Society, Hockessin	United States	Americas
51	Aveda Butterfly Garden, Minnesota Zoo, Apple Valley	United States	Americas
52	Bear Mountain Butterfly Sanctuary, Jim Thorpe	United States	Americas
53	BernieceGrewcock Butterfly and Insect Pavilion, Henry Doorly Zoo and Aquarium, Omaha	United States	Americas
54	Bioworks Butterfly Garden, Museum of Science and Industry, Tampa	United States	Americas
55	Blackwater Wildlife Refuge Butterfly Garden (Visitors Center), Blackwater National Wildlife Refuge, Cambridge	United States	Americas
56	Blooming Butterfly Garden, Como Zoo, St. Paul	United States	Americas
57	Brookside Gardens, Wheaton,	United States	Americas

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58	Butterflies and Plants: Partners in Evolution, National Museum of Natural History, Smithsonian Institution, Washington	United States	Americas
59	Butterfly Conservatory and Insect Zoo, Kansas State University, Manhattan	United States	Americas
60	The Butterfly Farm, Birmingham Zoo, Birmingham	United States	Americas
61	Butterfly Garden, Bronx Zoo, The Bronx	United States	Americas
62	Butterfly Garden, Museum of Science, Boston	United States	Americas
63	Butterfly House, Detroit Zoo, Royal Oak, Michigan	United States	Americas
64	Butterfly House, Dayton, Ohio Cox Arboretum MetroPark	United States	Americas
65	Butterfly House, Mackinac Island	United States	Americas
66	Butterfly House, Michigan State University, East Lansing	United States	Americas
67	Butterfly House, Missouri Botanical Garden, Chesterfield	United States	Americas
68	Butterfly House San Antonio Zoo, San Antonio	United States	Americas
69	Butterfly House, Whitehouse	United States	Americas
70	Butterfly Landing, Franklin Park Zoo, Boston	United States	Americas
71	Butterfly Magic, Tucson Botanical Gardens, Tucson,	United States	Americas
72	The Butterfly Palace and Rainforest Adventure, Branson, Missouri,	United States	Americas
73	Butterfly Pavilion, Natural History Museum of Los Angeles County, Los Angeles	United States	Americas
74	Butterfly Pavilion, Westminster, Colorado	United States	Americas
75	The Butterfly Place, Westford	United States	Americas
76	Butterfly Wing, Reiman Gardens, Ames	United States	Americas
77	Butterfly Wonderland, Scottsdale	United States	Americas
78	Butterfly World, Six Flags Discovery Kingdom, Vallejo	United States	Americas
79	California Academy of Sciences, San Francisco	United States	Americas
80	Cecil B. Day Butterfly Center, Callaway Gardens, Pine Mountain	United States	Americas
81	Cockrell Butterfly Center& Insect Zoo, Houston Museum of Natural Science, Houston	United States	Americas
82	Florida Museum of Natural History Butterfly Rainforest, Florida Museum of Natural History, Gainesville	United States	Americas
83	Frederik Meijer Gardens, Grand Rapids Township	United States	Americas
84	Key West Butterfly and Nature Conservatory, Key West	United States	Americas
85	Living Conservatory, North Carolina Museum of Natural Sciences, Raleigh	United States	Americas
86	Magic Wings Butterfly Conservatory, South Deerfield	United States	Americas
87	Magic Wings Butterfly House, North Carolina Museum of Life and Science, Durham	United States	Americas

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88	Marshall Butterfly Pavilion, Desert Botanical Garden, Phoenix	United States	Americas
89	Monsanto Insectarium, Saint Louis Zoological Park, St. Louis	United States	Americas
90	The Montgomery Zoo, Montgomery, Alabama (constructing a butterfly house which is planned to float in the natural lake on which the zoo was built)	United States	Americas
91	Orange County Native Butterfly House, The Environmental Nature Center, Newport Beach	United States	Americas
92	Panhandle Butterfly House, Navarre	United States	Americas
93	Puelicher Butterfly Wing, Milwaukee Public Museum, Milwaukee	United States	Americas
94	Sertoma Butterfly House, Sioux Falls	United States	Americas
95	Tradewinds Park Butterfly World, Coconut Creek	United States	Americas
96	Tropical Butterfly House, Pacific Science Center, Seattle	United States	Americas
97	Frederick Meijer Gardens	United States	Americas
98	Otago Museum Discovery World Tropical Forest, Dunedin	New Zealand	Americas
99	Australian Butterfly Sanctuary, Kuranda	Australia	Americas
100	Coffs Harbour Butterfly House, Coffs Harbour	Australia	Americas
101	Melbourne Zoo butterfly enclosure, Melbourne	Australia	Americas
102	Aguias da Serra Borboletario Sao Paulo	Brazil	Americas
103	El Mariposario, Quindío	Colombia	Americas
104	San Jose Butterfly Farm, San Jose	Costa Rica	Americas
105	MariposarioMindo, Mindo	Ecuador	Americas
106	Cali Zoo (450-square-meter (4,800 sqft) butterfly house)		Americas
107	Pilpintuwasi Butterfly Farm, Iquitos	Peru	Americas

V. SPECIFIC NECESSITIES FOR BUTTERFLIES

Butterflies require specific ecological conditions in Natural forests, grasslands, wet areas and trees as typical habitats. The extinction of a single species eventually leads to the extinction of more than a dozen species which in turn drastically affect the functioning of most natural ecosystems. To avoid this loss the management and conservation of butterfly fauna are practiced by *in–situ* and *ex–situ* methods. In the first case the natural habitats are added to by the introduction of butterfly host plants, however in the second case particular stocks of butterflies are maintained by the captive breeding and later reintroduced into suitable habitats through following a specific scientific methodology.

Local fauna can be supplemented through *in–situ* conservation (Heal 1973)[8]. The role of butterfly farming for promoting environmental conservation has been well recognized (Newman 1967)[9] in the past century. The important activities of butterflies are mainly foraging and breeding. Therefore, openings with bright sunshine,

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having some parts of shade, damp areas as well as hedges are essential elements of a butterfly farm. The variety of host plants include all forms of nectar plants like the *Ixora* species, *the Cassia* species., the *Allamanda cathartica, the Hibiscus rosa–sinensis, the Cupheam iniata, Zinnia haageana*, Marigold, the *Mussaenda luteola, the M. laxa* and the *Clerodendrum capitatum.* Besides these there is also urgent need of the larval host plants like *Michelia champaca, Cinnamom zeylanicum, Aegle marmelos, Citrus aurantia, Wattakaka volubilis, Thottea siliquosa, Tylophora indica, T. camosa, Asclepias* species, *Calotropis giganteum, Carissa carandus, Ruta graveolens, Aegle marmelos, Albizia lebbeck, the Cassia* species, *Murraya koenigii, Kalanchoe blossfieldiana* and *K. pinnata*.

The areas that have tall native trees have proved to be rather ideal for providing cool shade with sunlit patches which filtered through them and offered favourable habitats for several of the Papilionids (*Papilio buddha, P. polymnestor, P. helenus, P. paris, Troides minos, Pachliopta pandiyana and Papilio clytia*). These tend to fly rapidly through the bushes and treetops. They can be spotted quite frequently as they are feeding in the flower–heads of the *Clerodendrum paniculatum, Mussaenda and Ixora* species.

The Butterfly families of Papilionidae and Pieridae tend to show a continuous population trend for most of the year while others are seasonal like the Danaidae, Lycaenidae, Satyridae, Nymphalidae and Hesperiidae.

VI. CONDITIONS FOR BUTTERFLY REARING IN THE GREAT GANGETIC PLAINS

Rearing of butterflies has since long been recommended for conservation–oriented programmes (Morton 1991)[10]. Butterfly collections became a serious indulgence and vocation for many people in the West, during the 19th century. There was a fashionable growth of talk son collections, identification and cataloguing of butterflies in several regions of the modern world. Butterflies were maintained in glass–houses which were then subsequent opened to the public as butterfly houses. Because of natural mortality factors due to unfavourable conditions like drought, wind, temperature etc. and incidence of parasites and predators, the survival rate of butterflies in the wild has been observed to be merely 2%. However, by shielding these same butterflies from adverse conditions the survival rate has been known to be enhanced to almost as high as 90%.

Butterflies, unlike most vertebrates require little space for farming, and because they reproduce rapidly they are not cost prohibitive. Very many technologically supported, sophisticated structures are not required especially in tropical conditions. The technological simplicity of butterfly farming minimizes the capital investment strain on the under–developed or developing countries to establish butterfly–breeding and farming initiatives. Butterfly–breeding techniques are simple comparatively and can be conveyed to the farmers with simple demonstrations.

Most of the tropical butterflies that inhabit the Great Gangetic Plains require daytime temperatures of 25°C and relative humidity of 85%–95%. There are some tropical species that require almost 100% humidity to mate. Night temperatures can drop to around 15°C. Butterflies should have access to moist sand. Spraying the ground with a mist of water has been considered to be the most–suitable way. Many of the butterflies need to bask under radiant heat sources to bring their body temperatures up to 32°C–35°C for oviposition. Appropriate larval host plants should be provided. Eggs should ideally be surface–sterilized by treating with 0.1%–0.2% sodium

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hypochlorite (up to 10 min) or 10% formaldehyde (up to 30 min) to protect them from infection of any sort. The eggs can later be stored in small plastic tubes, loosely plugged with cotton wool.

The two basic necessities for butterfly farming are a continued supply of nectar plants for adults and suitable food plants for the larvae. As caterpillars are highly voracious, they can finish off the host plants in a very short period, and therefore, a sufficient quantity of host plants are required in the feeding chamber. The larvae, when fully mature, undergo pupation by attaching to a substratum with the help of fine silken filaments. The adults that emerge can flutter within the hatchery until the wings become hardened. There after these young latching they may be maintained in the butterfly–release area. This area is also suitably provided with nectar and oviposition plants for mating.

VII. PLANTS PREFERENCES AND DIET

Important factors to be considered while choosing nectar plants are the feeding preferences of the butterfly species and the length and timing of flowering. Lycaenids and Pierids with short proboscis prefer smaller flowers (e.g. Compositae). Larger Papilionid butterflies prefer flowers having a long pistil like the *Hibiscus*, *Ixora*, and *Clerodendrum capitatum*. Species such as *Clerodendum capitatum, Cuphea*, Marigold, and *Ixora* species, which flower almost throughout the year in the Great Gangetic Plain could become commonly–used plants in butterfly farms being set up in this region.

Adequate number of nectar plants in bloom should be maintained in the butterfly–release area. Some butterflies show preferences for fruits, berries, sap, dung and even carrion. Rotting fruits, to which about 10% honey or toddy is mixed to allow for fermentation, are ideal to get the species attracted to the fruits. For many species, use of mud or sand mixed with salt or animal excreta are important for mud puddling.

The most common cause of failure of Lepidoptera captive–breeding programmes is the inability to secure pairings and fertile eggs. Most of the butterflies require a suitable environment for the display of elaborate courtship behaviour. Suitable dimensions for a flight arena relate to the overall wingspan of the particular species as: length 20–25 x, height 10–15 x, depth 10–15x. Large cages should be avoided as some species tend to disperse to the roof and sides, and thus end up ignoring potential mates. The presence of the larval host plants within the rearing cages stimulates the pairing in many of the butterfly species.

The current conservation strategy gives priority to protecting the entire ecosystem rather than protecting just a single species. Butterfly gardening is an approach that partially fulfils this aspect of conservation. Such farms not only serve as centres of conservation but also as hubs of awareness creation among the younger generation.

VIII. SPECIAL COMMERCIAL USES OF BUTTERFLY FARMS

Event organizers sometimes purchase butterflies from breeders so that they can be released during special events. Some of these events can include:

8.1. Sports events like the Olympics, Asiad etc.

8.2. Memorial services

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8.3. Birth days

8.4. Cancer survivor Memorial services

8.5. Hospice -related Memorial services.

8.6. Founders days

8.7. Funeral services

8.8. Inaugurations

8.9. Religious ceremonies

8.10. Martyrdom days

8.11. One day educational seminars

8.12. Weddings

8.13. Anniversaries

8.14. Other special Occasions

The event organizers tend to get their butterflies from local breeders and those who have advertised on their websites. During the event the butterflies are released at a particular juncture by the Chief functionary, VIPs, guests or special invites. The release of the butterflies is a colourful event.

IX. COMMERCIAL VALUE OF BUTTERFLIES

9.1 The Intrinsic value of Butterflies

9.1.1.1. Butterflies are intrinsically mostly valuable and are therefore most worthy of all conservation efforts made in their own right.

9.1.1.2. Butterflies are a large part of the Life of all creatures on Earth and are an important component of its rich biodiversity.

9.1.1.3. Butterflies have been around for over 50 million years and they had probably first evolved some 150 million years ago.

9.1.1.4. Butterflies tend to be a highly diverse group comprising well over 250,000 species and they make up around one quarter of all the named species on Earth.

9.1.1.5. Butterflies can be said to be a flagship species for conservation in general, and in particular for the invertebrates.

9.2. Provision of Aesthetic value by Butterflies

9.2.1. Butterflies can be said to a part of mankind's natural heritage and they have been studied by various scholars for over 300 years.

9.2.2. Butterflies are iconic of freedom and beauty and most popular among children.

9.2.3. People of all age groups like butterflies and are enraptured to see them flying around.

9.2.4. There are several references to butterflies in literature. Beginning right from the Bible through Shakespeare to modern day literature and from poetry to musical lyrics. Butterflies are currently celebrated in literature and art even cinema and they are often used in ads for beauty and fashion products.

9.2.5. Butterflies are used by advertisers and illustrators the world over as way of indicating that their products are environmentally friendly.

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9.2.6. Butterflies are more often than not portrayed as the very essence of nature. They are seen as usually representing freedom, beauty mercy and peace.

9.3. The Educational value of Butterflies

9.3.1. Butterflies have fascinating life-cycles that have been used in most countries to teach children and science students at various levels about the natural world. The transformation from egg to caterpillar to chrysalis is seen as one of the wonders of nature.

9.3.2. Besides the life cycle there are other educational aspects which include the intricate wing patterns as well as their iridescence. These can be used as examples for studying insect migration.

9.4. Scientific value of Butterflies

9.4.1. Butterflies can be said to be some of the extremely important groups of 'model' organisms which have been used, for centuries, to investigate many areas of biological research, including vastly diverse fields like navigation, pest control, embryology, mimicry, evolution, genetics, population dynamics and biodiversity conservation. It is only when they awaken to their true scientific value that the community can be oriented to cultivate a scientific temper towards the rearing and release of butterflies.

9.4.2. Butterfly studies have a long history which has provided over the years a unique data resource on an insect group which has been unmatched in the geographical scale as well as the timescale fixed anywhere in the world. This has proved extremely important for scientific research on a number of issues like climate change or even global warming and depleted world environment.

9.5. The Ecosystem value of Butterflies

9.5.1. Butterflies can be said to the indicators of a healthy environment and a healthy well balanced ecosystem.

9.5.2. Butterflies are indicative of a wide range of various invertebrates, who tend to comprise more than over two-thirds of all species.

9.5.3. Areas rich in butterflies are usually rich in other invertebrates as well. These collectively provide a wide range of environmental benefits, including pollination and natural pest control besides the additional natural products like honey, resins etc.

9.5.4. Butterflies are an important element of the food chain and most often they are prey for birds, bats and other insectivorous animals. Not only butterflies but their caterpillars and pupae also tend to be food for several predators.

9.5.5. Butterflies support an entire range of various predators and parasites. Most of these are specific to particular species, or a specific groups of species for their nutritional needs.

9.5.6. In order to study the impact of habitat loss and fragmentation due to climate change and other factors ecologists have widely used butterflies as model organisms.

9.6. The Health value of Butterflies

9.6.1. Most People enjoy watching colourful butterflies both around their homes and all over the countryside.

9.6.2. Over 10,000 people record butterflies in the UK alone, involving getting outside and walking considerable distances.

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9.6.3. Several thousands of people sponsor garden's for wildlife in the UK, many of them specifically for butterflies.

9.7. **Economic value of Butterflies**

9.7.1. Thousands of people travel abroad each year looking for butterflies as a hobby. Eco-tours bring valuable income to many countries and developing countries around the world could take a leaf out of their books.

9.7.2. Every butterfly has to develop its own suite of chemicals to deter predators and parasites for finding a mate, and overcoming the chemical defences of the host plant. Each of these chemicals has a potential value and could be exploited economically. For example, powerful antibiotics have been found in the Meadow Brown, one of the commonest and most widespread species of butterfly similarly others could be also studied scientifically.

X. CONCLUSION

The true commercial value of Butterfly Farming can be accessed from the renewed thinking that has engulfed the farming community, scientists and youth who are all attained to the vital need for environmental conservation. Most of these lobbies are willing to make concentrated efforts to preserve the natural resources. They are willing to refurbish the fast depleting environment through the adoption of interventions that do not pose any further threat to the already suffering environment.

Indian agriculturists of the Great Gangetic Plains have access to all the favourable conditions for setting up butterfly farms. Not only are they an additional economic source, they are instrumental in providing significant inroads to environmental conservation and adding to the joy of the community when these colourful creatures are released collectively.

Commercial butterfly farmers plant native plants on the property, providing food sources for the caterpillars. Commercial butterfly breeders generate employment and support the rural economy. It inhibits the rural to urban movement patterns.

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