

Appraisal of Bee Indicator as Ecological Element on Sustainable Approach

¹Nur Afikah Idrus, ¹Mohd Yazid Mohd Yunos, ²Nor Kalsum Mohd Isa and
³Khairul Aidil Azlin Abd Rahman

¹Department of Landscape Architecture, Faculty of Design and Architecture,
Universiti Putra Malaysia, 43400 Serdang, Malaysia

²Department of Geography and Environment, Faculty of Human Sciences,
Sultan Idris Education University, 35900 Tanjong Malim, Malaysia

³Department of Industrial Design, Faculty of Design and Architecture,
Universiti Putra Malaysia, 43400 Serdang, Malaysia

Abstract: The Earth's Biological diversity is a major dangerous scourge of habitat loss influenced by human activities towards land transition into development. The increasing of habitat's disruption also solvent on ecological effect of insect. The study highlight the important of bee's behavior provide a vital link between the element of landscape Ecology and the engagement to enhance the concept of sustainable. Thus, bees encounter crucial behavior as a pollinator in ecosystem conservation and stability, genetic variation with floral diversity and community, specialization and evolution. A qualitative research method which implies descriptive and content analysis is utilized to convey the research. The behavioral of bee describes the experience development in the ecological element that captured into the sustainable approach. As a conclusion, the study expected that the behavioral of bee component is very significant to maximize colony product as well as to gain more sustainable profit in supporting the landscape environment and enhancing the preference of ecological. Therefore, this study tends to impart in figuring out the problem of sustainable practice and contribute to who in built environment profession for setting the best sustainable instrument in the landscape project. In order that this approach can be economical, environmentally and socially with great function and aesthetic beneficial in the future development.

Key words: Bee, behaviour, Ecology, sustainable, landscape, development

INTRODUCTION

Bee works extensively in managing the agricultural landscape services but little known the performance of bee on the physical ecosystem. A serious weakness of this argument, however is that in tropical forests many species of flora and fauna would not persist if the bee were disappeared. Bee is one of social insect generally lead their ecological indentation prior to the community has reduced almost struggling moment (Wilson, 1971). A reasonable approach to tackling this issue could be the performance of bees in the distinction ecosystems in their pollination endeavor. The term pollination is defined as a shift of pollen from the anther which is the male part of the flower to the stigma basically known the female part of the flower (Hamilton, 1964). The awareness of pollination by animal pollination called "Zoophily" in the tropical is still failed to acknowledge the significance and has a number of limitation. Pollinators robustly give impact

on ecological relationships either in ecosystem protection and permanence, floral eugenic multiplicity and transformation of the species. Thus, the knowledge in the social behavior of bee need much work and comprehensive study has to be done in this area.

The honeybee (*Apis mellifera*) is generally assumed to play a role in distribution pollinator (Klein *et al.*, 2007) which pollinated flower using nectar tube not more than 2 cm long. Bee captivates to white, blue and yellow flower rather than red and regularly blossom flower pollinated during daytime (Cane, 2001). Whereas plants pollinated by insects known as "Entomophilous" and insect's emphasis broadly as pollinators (Keller and Waller, 2002). Besides with a large number of honeybee's efficiency, bee performance of foraging can be in various plant species at a certain time based on bees physical and behavior. It seems possible that these results are due to millions of years showed that bee and most flowering had evolved a mosaic interdependency.

In addition, it is important that bees find food and flower. Interestingly, the foraging behavior is one of the outstanding behaviors of bee. This is exemplified in the behavior undertaken by the integration of the honey bee colony and the atmosphere of the surrounding. There is a special mechanism that evolved by bee-pollinated flower where bee release the anthers to spring alternately either up or down to binding the pollen. Bee differs from other insects not only in physical attributes which have extremely hairy but also in the way in contributing to sustainable approach that each hair has branched structure conceive notably effective and efficiency at catching pollen. Thus, it reveals that bee is the distinctive insect that gives high dynamic population throughout bee's behavior process and system.

Bees and trees have respect to each other. The honeybee appoints nesting berth in forest biotopes tree rather than in an open landscape or ground. However, bees nowadays face the risk to survive as pollinator and making pollination threat by agricultural accentuation, such as disclosure to pesticides (Henry *et al.*, 2012; Pettis *et al.*, 2013), bee pathogen synergy low immune capability due to monofloral pollen diets (Alaux *et al.*, 2010) or mundane divergence in pollen attainable due to monocultures, habitat disaster and fragmentation (Potts *et al.*, 2010). Perhaps the most serious disadvantage of this threats, another potential concern is that agricultural production is responding on pollinators is highly boost in the last two decades (Aizen *et al.*, 2009). The negative bounce of insecticides on bees specifically has never been the squall. Furthermore, tremendous natural variability in bee colony and difficult with outline preference about pollinator and pollination through observations of pollination insufficient in the plant (Shuker, 2001) construct the provocation to vigorously determine pollinator descent and will getting the loss. While a few scientific figure out the important of bee behavior as pollinator and care about pollinator conservation shifting of natural habitats to human appliance consequence from the bee (Cane, 2001). Therefore, the field of landscape studies corresponding to the ecosystem that bees are present in the forest is providing better pollination that spark to enhance regeneration of trees and protecting the forest's biodiversity.

The key aspects of bee behavior management influence the ecological element can be listed as the bee as the pollinator in ecosystem conservation and established, genetic innovation with varieties species of floral and the increase of specialization product. Besides, there is some evidence that spatial enlightenment caters by bee dances to consider the foraging Ecology of

this lead pollinator express that landscape fabric, resource serviceability and foraging distance occasion (Steffan-Dewenter and Kuhn, 2003). There are three reasons why bee's behavior has become so dominant in this study. However, the way how bee behavior leverage for the sustainable approach is still unknown, despite inclusive application on keeping pollination duty and preserving honey bees from privative impact (Hartel and Steffan-Dewenter, 2014). Thus, bee behavior is not only harming for the colony and for plant pollination but give profit to educate certain aspects in the future. Without bee biodiversity and evolution, the ecological would not be great. Therefore, a stable environment conceives great feasibility of development and determine the ecological niches.

Significance of bee behaviour: Generally, the behavior of insects is of intuitive character that shown the compensation attain as a counter to a distinctive perceived by the positive organ of sense. The behavior can broadly be defined as not only physical matter but also the spiritual element. Thus, this study count on bee behavior is a good evidence of insect that adequate of learning the process to solve for better sustainable life. For instance, bee entirely manageable to give the lesson that recognizes geometrical character which catching food from vessels of convinced shape and color. Despite this, little progress has been made in the single worker bee ascertain and remind the distinct time flower are virtue look around. Several flowers are expensive with nectar entire day and night but unlike others noticeable in the certain moment. Another significant aspect of bee that can communicate with them and impact of knowledge (Rozhana *et al.*, 2015). The competence of the honeybee found a good nectar or pollen inception that bee will return to the colony and correspond to other bees where the bee can treasure food. It seems possible that these result may be due to particular hustle express the distance, attribute and path from the nest are almost accurate. Therefore, the bee performance carried out certain body coherent with the direction and nature of the movement and give guidance to other bees. Thus, bee behavior is a strong possibility that will improve the ecological sustainability in the long term.

Slingshot power: Almost every moment, bee and other flying insects embrace their wings posterior strengthen constraint before liberating them such as a child stretch out on a slingshot before unforeseen releasing it. Besides, the succession of the strength and ounce for ounce productivity of primitive physical energy, these little vibrations attain sovereign, prompt flight cause a

resistance of the integral joules essential to power on a par human engineered invention (Alqarni, 2006). Homogenously, the superlative frequency of wing rhythm is influenced in some chain by fibrillary muscle which proof and deliverance with intimate automatic and pursue promptitude introducing by one nervous impulse that the wings are seen only as a sprinkle development (Wootton, 1984). These analytical performances obtained the intensification of competency may be accomplished by the wings being temporarily held in the developing of tension produce impromptu change. Thus, far the development of rapidity or supervision is brought about the alternative specified of muscles. In this study, it has been explained that bee behavioral support the sustainable product design that cost of lower energy production and transformative perspectives in green power.

Always clean lenses: The appropriate apparent is surrounding around us is tidy up especially the tiny insects is clean gratuitous. Many scholars hold the view to extend self-cleaning incentive to solar panels and enlighten the invention that embarrassed by dust and dirt mass (Anonymous, 2012). Moving on now to consider the behavioral of bee having the eyes of flying insects with soft hairs convey beyond their exterior that defends the eye neat from airborne particles. Here, the air moves over the hairs deflate the tendency of airborne particles before the eye's contact. Despite this, little progress has been made in solar panel that thin filaments could be set up sporadically to attach the dust over the panel but still let light to penetrate (Safee *et al.*, 2015). Thus, cleaning the solar panels would expance directly to wiping it with the new brush. Just like the bee behavior, the panel could get fresh without the use of water or chemicals.

Electricity sensor: Bee illustrates this point clearly that have so, many superpowers which surprisingly bee can also detect weak electrical charge drastically. This evidence presented just before a thunderstorm as its configuring, light electrical beat begins charging the air, the related pulse that will conditionally enlarge into lighting (Abou-Shaara *et al.*, 2013; Asif *et al.*, 2015). Therefore, bees have extraordinary sensors that encounter the pulses and generate the bees to repossession back to the hive and waiting out of the storm demonstrates the human need for better strategies.

MATERIALS AND METHODS

The use of qualitative research method is the well-established approach which designates descriptive and content analysis of bee behavioral. A major

advantage of this method can highly experience the development of characteristic of bee towards the ecological element that seizure into sustainable design practice. In order to identify the behavioral of bee, comprehensive study on literature review is made and a series of transfections was performed to evaluate. Thus, throughout the in-depth literature review, discovering the important variables of bee behavior that relevant to sustainable practice and enhancing the bee as one of standout insect to solve daily problem.

RESULTS AND DISCUSSION

The honeybee is classified on the basis of three different kinds that live inside a bee hive. Generally, the hive cannot remain alive except it has all three which is the queen, worker and drone by having the own superior function. The queen bee has the longest body but unlike the worker bee that having the stringer who does not look alike barb of fish-hook on the end of it. However, the queen bee can sting several times and not die from the operation of stinging. Whereas the worker bee is the one who flying around the stunning flowers and alarming people's face of stinging while it feels threatened or protects a bee hive. The task of the worker bee is flying out and suck up the nectar flower and bring back to the hive that eventually gets into delicious honey. Compared to the queen bee and the worker bee, it is very large bee living in the hive known as the male drone, at least in its width and bulk. Numerous studies have compared the honeybee character on entomology and found that bee is having essential behavior to be reveal. Bee is very tiny insect that contributes to a healthy environment and economy.

In line with the finding to solve numerous threat of bee are facing in ecological effect such as changes in land use, habitat loss, building project, pesticides, farming practices and pollution there is a set of analysis through behavioural of bee examined the impact to enhance the ecological problem and possibilities to established as sustainable practice.

Closer inspection of Table 1 shows the characteristic of bee produces remarkable behavioral beyond common sight. A positive correlation was found between apprising the bee behavior and reviving the ecological element thus provide the clear opportunities to the sustainable approach. Interestingly, there was also

Table 1: The contribution of bee behavior on sustainable approach

Bee indicator	Ecological element	Sustainable approach
Slingshot power	Automatic energy (earth)	Ecosystem conservation and stability
Always clean lenses	Solar panel (air)	Resource serviceability
Electricity sensor	Lighting (fire)	Evolution transformation

some more interpretation on designing method relation with nature known as biomimicry that can be as guidance in the future development.

The perspective for bee in the moment is quite bleak where a few numbers of bee drop as a marked of the plight of the natural world as a whole. Across civilization often minimizing nature around us and government often establish business and build up development before secure or boost to the natural environment (Krupke *et al.*, 2012). The verity is people want an economy that beneficial for everyone needs in expanded time as follow everyone need to insurance disturbance around our environment (Odoux *et al.*, 2012). Besides, the politicians ought to conceive the importance of keep safe the natural world, especially, give sanctuary to bees as important players in it. This inconsistency may also be due to environmental changes issues meanwhile the bee need to have genetically varieties of plant. One and the only way to fixed the mixing of genes for the plants is by cross-pollination where shown the usefulness of bee as transporter the pollen from one plant to another in order that offspring become genetically diversity (Malone and Burgess, 2009). Since, there is huge adventitious for trivial some of the offspring to keep afloat in the game of life. This is an important factors bee is needed in this biodiversity.

Despite this bee biodiversity problem, people also in trouble and further action need to be taken for the sake of stability ecosystem and ecologically protection. There are few suggestions can be developing by doing a simple thing to preserve the bee. An example of this is planting flowers rich in nectar will support the bees need for their foraging. In addition, encouraging relatives and neighbors to participate in creating bee-friendly community campaign part of the initiative instrument to save the world of bee (Fahrig, 2003; Azmeea *et al.*, 2016). In support of this program relevant to display the community live behavior anticipated from the colony of the bee as approaching the sustainable way of life (Hansell, 1996). This is certainly true in the case of the design-build strong community that promoting sustainability awareness and education as follow provide social interaction among others. In addition, creating a garden with fresh air and gentle exercise reform health and well-being. The way of the community taken care of bee-friendly growing will count on the outside scale but with neighborhood drive, bee colony will be saved. Thus, the bee can be protected and maintaining the unique culture of the ecosystem.

Therefore, the potential of appraisal bee behavior highly relevant to be a source of sustainable approach via. ecological element. Together it will contribute to

policy makers to be the message to build better neighborhood behavior. In order to assess the actual characteristic of bee for better and stable environment, further studies are needed to determine the spatial distribution of bee behavior as resource use to estimate the real world combination.

CONCLUSION

This research extends our knowledge of the function of insect especially bee as the pollinator to the flowering plants. Bee gives the product that bee themselves are illustrated with esoteric and various significance. To ancient Greeks and Romans called bee and honey were the “Nectar of the god” represent the healing virtue and supernatural powers. The contribution of this study has been to confirm bee behavior convey the ecological element and offer valuable insights into the sustainable approach. A natural progression of this researcher to analyze the behavioral supporting the community development would be very interesting. Therefore, ensuring appropriate systems, services and support for appraising the bee behavior should be the priority for future practice thus will help to establish more ecologically friendly and integral sustainable design.

ACKNOWLEDGEMENTS

The research was part of the project under Fundamental Research Grant Scheme (FRGS) and we are grateful for the financial support provided. We kindly thank all members of WARIS Research group and communities from Universiti Putra Malaysia for this helpful suggestion and comment throughout this study.

REFERENCES

- Abou-Shaara, H.F., A.A. Al-Ghamdi and A.A. Mohamed, 2013. Honey bee colonies performance enhance by newly modified beehives. *J. Apicult. Sci.*, 57: 45-57.
- Aizen, M.A., L.A. Garibaldi, S.A. Cunningham and A.M. Klein, 2009. How much does agriculture depend on pollinators? Lessons from long-term trends in crop production. *Ann. Botany*, 103: 1579-1588.
- Alaux, C., F. Ducloz, D. Crauser and Y. Le Conte, 2010. Diet effects on honeybee immunocompetence. *Biol. Lett.*, 6: 562-565.
- Alqarni, A.S., 2006. Tolerance of summer temperature in imported and indigenous honeybee *Apis mellifera* L. *Saudi J. Biol. Sci.*, 13: 123-127.

- Anonymous, 2012. Crop areas, yields and production, livestock populations and the size of agricultural workforce: 2011. Department for Environment, Food and Rural Affairs, London, England, UK.
- Asif, N., N. Utaberta, M.A.O. Mydin and M.Y.M. Yunos, 2015. Redefining Islamic garden: Comparative analysis of approaches, ideas and design framework. *J. Teknologi*, 75: 77-81.
- Azmeea, N., M.Y.M. Yunosa, M. Azree, O. Mydinb and S. Ismaila *et al.*, 2016. Analyzing the features of Mughal garden design: Case of Taj Mahal, Agra, India. *J. Teknol.*, 78: 165-168.
- Cane, J., 2001. Habitat fragmentation and native bees: A premature verdict?. *Conserv. Ecol.*, Vol. 5,
- Fahrig, L., 2003. Effects of habitat fragmentation on biodiversity. *Ann. Rev. Ecol. Evol. Syst.*, 34: 487-515.
- Hamilton, W.D., 1964. The genetically evolution of social behaviour. *J. Theor. Biol.*, 7: 17-52.
- Hansell, M.H., 1996. Wasps Make Nests: Nests Make Conditions. In: *Natural History and Evolution of Paper-Wasps*, Turillazzi, S. and M.J. Wes-Eberhard, (Eds.). Oxford University Press, Oxford, England, UK., ISBN:9780198549475, pp: 272-289.
- Hartel, S. and I. Steffan-Dewenter, 2014. Ecology: Honey bee foraging in human-modified landscapes. *Curr. Biol.*, 24: R524-R526.
- Henry, M., M. Beguin, F. Requier, O. Rollin and J.F. Odoux *et al.*, 2012. A common pesticide decreases foraging success and survival in honey bees. *Sci.*, 336: 348-350.
- Keller, L.F. and D.M. Waller, 2002. Inbreeding effects in wild populations. *Trends Ecol. Evol.*, 17: 230-241.
- Klein, A.M., B.E. Vaissiere, J.H. Cane, I. Steffan-Dewenter and S.A. Cunningham *et al.*, 2007. Importance of pollinators in changing landscapes for world crops. *Proc. R. Soc. London B Biol. Sci.*, 274: 303-313.
- Krupke, C., G. Hunt, B. Eitzer, G. Andino and K. Given, 2012. Multiple routes of pesticide exposure for honey bees living near agricultural fields. *PLoS ONE*, Vol. 7. 10.1371/journal.pone.0029268.
- Malone, L.A. and E.P.J. Burgess, 2009. Impact of Genetically Modified Crops on Pollinators. In: *Environmental Impact of Genetically Modified Crops*, Ferry, N. and A.M.R. Gatehouse (Eds.). Centre for Agriculture and Bioscience International, Oxfordshire, England, UK., ISBN:978-1-84593-409-5, pp: 199-223.
- Odoux, J.F., D. Feuillet, P. Aupinel, Y. Loublie and J.N. Tasei *et al.*, 2012. Territorial biodiversity and consequences on physico-chemical characteristics of pollen collected by honey bee colonies. *Apidologie*, 43: 561-575.
- Pettis, J.S., E.M. Lichtenberg, M. Andree, J. Stitzinger and R. Rose, 2013. Crop pollination exposes honey bees to pesticides which alters their susceptibility to the gut pathogen *Nosema ceranae*. *PloS One*, 8: e70182-e70190.
- Potts, S.G., J.C. Biesmeijer, C. Kremen, P. Neumann and O. Schweiger *et al.*, 2010. Global pollinator declines: Trends, impacts and drivers. *Trends Ecology Evol.*, 25: 345-353.
- Rozhana, A., M.Y.M. Yunos, M.A.O. Mydinb, N.K.M. Isaa and N.F.M. Ariffina *et al.*, 2015. Building the safe city planning concept: An analysis of preceding studies. *J. Teknol.*, 75: 95-100.
- Safee, F.A., M.Y.M. Yunos, S. Ismail, N.F.M. Ariffin and N.K.M. Isa, 2015. Establishing elements of a good city planning: An analysis of city planning theories. *J. Teknol.*, 75: 101-105.
- Shuker, K., 2001. *The Hidden Powers of Animals: Uncovering the Secrets of Nature*. Reader's Digest, London, England, UK., ISBN:9780762103287, Pages: 240.
- Steffan-Dewenter, I. and A. Kuhn, 2003. Honeybee foraging in differentially structured landscapes. *Proc. R. Soc.*, 270: 569-575.
- Wilson, E.O., 1971. *The Insect Societies*. The Belknap Press of Harvard University Press, Cambridge, UK., ISBN: 978-0674454903, pp: 562.
- Wootton, A., 1984. *Insects of the World*. 2nd Edn., Blandford Press, London, England, UK., ISBN: 9780816052103, Pages: 224.