

# A Study on Suitable Habitat for Swiftlet Farming

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**Abstract**— Swiftlet farming is a new industry in Sarawak as compared to other long-standing industries such as rubber, palm oil and timber. It is one of the businesses that involved a small capital investment that could generate enormous returns in the future. Swiftlet farming involves the conversion of human-centric building into structures for Swiftlet. The purpose of this conversion is to let Swiftlet for nesting and protect them. The design and construction of such building will also helps to accommodate Swiftlets' population. The nest of the Edible-nest Swiftlet rank amongst the world's most expensive animal products. Therefore, in order to increase the productivity of bird nest, study of the suitable habitat for Swiftlet should be done thoroughly. Environmental factors such as air temperature, surface temperature, relative humidity, air velocity and light intensity are the key factors for a successful Swiftlet farm house. Internal air temperature of building should be maintained from 26<sup>o</sup>C to 35<sup>o</sup>C, relative humidity from 80% to 90%, low air velocity and light intensity less than 5 LUX. Proper ventilation and installation of a humidifier could help the building to achieve the desirable range of environment factors. Location of structure will also be considered from direct sunlight direction to reduce the internal temperature. Only licensed Swiftlet farming is legal.

**Keywords:** Swiftlet Farming, Air and Surface Temperature, Relative Humidity, Air Velocity, Light Intensity

## 1. INTRODUCTION

**S**WIFTLET is a type of birds similar to swallows, sparrows and house swifts but they are not closely related to each other. Swiftlets have short legs and never settle voluntarily on the ground. They perch vertically on surfaces or their nesting planks. Currently there are 24 species of Swiftlets recorded in the world. The five most common species of Swiftlets found in Malaysia and Borneo Island are *H.Gigas*, *C. Esculent* (White belly swifts), Asian Palm Swift (*Cypsiurus Balasiensis*), *A. Maximu.* and *A.Fuciphagus* [5]

*Aerodramus Fuciphagus* is a particular species of Swiftlet that produces edible bird nest, only available in the Southeast Asia region. It consists of 90-95% of edible nest and 5-10% of feathers and purities [5]. The Swiftlet edible-nest have been a species of concern today due to high market value of their nest that of building entirely out of saliva as shown in figure 1. Upon drying, the saliva forms hard cement (nest cement) and secures the bracket shaped nest to the cave wall as well as forming the cup [3]. Ever since the 16<sup>th</sup> Century, when Swiftlet nests became an important item in Chinese cuisine and for medication, Swiftlet edible-nest have been exploited throughout their range [4] and [8] In 18<sup>th</sup> Century, the volume of trade was enormous, and early in 19<sup>th</sup> Century, about 9 million nests weighting some 76 tonnes were imported into China each year [4] Matured birds' nests will be harvested and sold to the market at handsome price and now rank amongst the world's most expensive animal products.

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Figure 1: Edible bird-nest

While across their range, cave populations of the Swiftlet Edible-nest have been declining due to over exploitation of their nest. This has been considerably offset by the rapid growth of Swiftlet farming in Southeast region especially in Indonesia and Malaysia [6] and [9].

The Swiftlet farming industry in Malaysia only started to gather momentum after the Asian Economic Crisis of 1997-1998. During that period, many businesses, especially small to medium sized businesses, experienced hard times and a great number of them closed down throughout the country.

The premises that these businesses were located in were vacant due to the fact that no other businesses had sprung up to take their place as a result of the depressed economic environment at that time. Rather than leave their properties idle, quite a number of the landlords of these properties then decided to convert their untenanted properties into Swiftlet farms. Although the shophouses converted to Swiftlet farm house is restricted by law in certain states in Malaysia, building the farm house on agricultural land is permissible.

It is a difficult task to make sure that the Swiftlet farming that had been built could attract the Swiftlet to start breeding in the new habitat. So far there is no specific study on the design aspect of Swiftlet farm house. Most of the building built based on past experience of Swiftlet farming company. A major concern, which prompted this study, is that despite the mass building of this type of farm house, no technical evaluation has been done to establish that the technology provides the necessary internal airflows, relative humidity, air temperature distribution and light intensity to provide a suitable environment for Swiftlet breeding. Since it is quite impossible to adapt a man-made building to be the equivalent of a million year old cave, it pays to artificially induce the internal and external ecology to imitate that of a cave. Therefore, preliminary study on the suitable environmental factors that new habitat could provide should be done thoroughly.

## 2. OBJECTIVE

The objective of this study is to determine suitable environment requirements for Swiftlet farming. The relationship between air temperature, surface temperature, relative humidity, air velocity and light intensity in Swiftlet farming in order to create a suitable environment for Swiftlet breeding is evaluated and suggested.

## 3. METHODOLOGY

A Swiftlet farm house located in Asajaya, Sarawak was selected for experimental works on the suitable habitat of Swiftlet. A photograph of the typical Swiftlet house farm is shown in figure 2. The two storeyed structure have 9 feet height and area of 1210 square feet each floor. Area of 1210 square feet was including the roving room which is considered as the entrance and light blockage area. The structures are made of hollow brick with internal plastering, 'bakau' as foundation and *belian* timber as column and beam. This particular Swiftlet farm house has been operated since July 2008 and it is currently occupied with 30 Swiftlets and 10 nests.

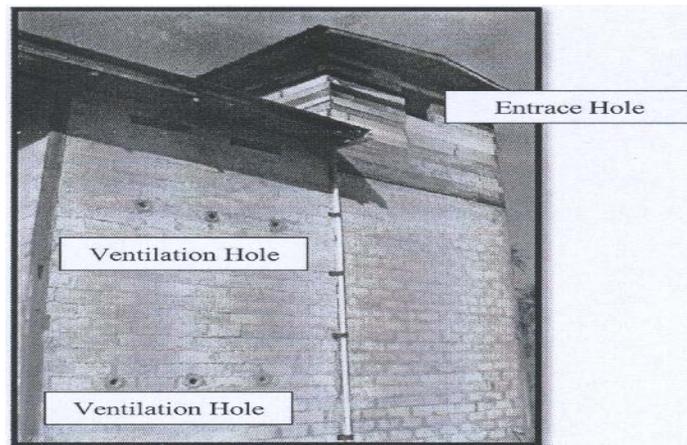


Figure 2: Swiftlet Farm House located in Asajaya, Sarawak

Globe thermometer, thermal hygrometer, anemometer, data logger and photometer were used for for the study. During the experimental works, equipments are placed at several locations in the farm house for data collection. Related data at each corner as well as the centre of the building were collected.

Several different monitoring configurations were undertaken to investigate the factors that may affect internal environment of the Swiftlet farm house. Data on the building related environment were collected and analysed under four different conditions for comparison purposes. The four conditions are:

- Condition 1: Building is fully closed
- Condition 2: Ventilation holes Provided
- Condition 3: Humidifier Installed
- Condition 4: Ventilation holes and humidifier provided

Thermocouples connected to a data logger are used to collect the air temperature and selected wall surface temperature within one hour interval. Other related data on relative humidity, air velocity and light intensity were also recorded in one hour intervals. In Condition 3 and 4, humidifier is installed in the farm house to control the humidity in the area. Light intensity reading will also be taken using photometer during day time to indicate the light intensity in LUX unit. These data were collected 25 hours after each conditions of the building were set-up. This duration is important for condition settlement time.

The allowable time to gather data on air and surface temperature, relative humidity, air velocity and light intensity was between 10:30 a.m. to 3:30 p.m. The farm house was vacant and the Swiftlets were out for food and will be back around 3:30 p.m. Frequent disturbances and visits to the inside the farm house would scare away the Swiftlets. Therefore, the suitable time should be chosen in order to refrain from entering the birdhouse unnecessarily.

#### 4. DATA ANALYSIS

All the data obtained from the site had been analyzed to evaluate the relationship between air temperature, relative humidity, air velocity and light intensity in Swiftlet farm house in order to create and suggested a suitable habitat for Swiftlet breeding.

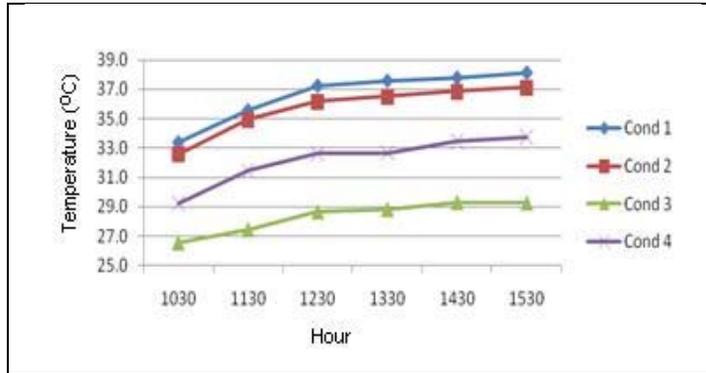


Figure 3: Air Temperature

Figure 3 shows that the highest air temperature occurred in Condition 1 when the building is fully closed and followed by Condition 2, when only ventilation hole provided. Air temperature for Condition 1 and 2 are higher than allowable range of the maximum 35°C during critical time from 11.30 a.m until 3.30 p.m. The lowest air temperature occurred in Condition 3 when the humidifier is provided. Internal air temperature increase when both humidifier and ventilation holes provided in Condition 4. It shows that although the internal temperature is lower due to the effect of humidifier, the external air temperature and air circulation also play important role on internal environment. Both Condition 3 and 4 are still within the acceptable range of temperature and suitable for Swiftlet habitat.

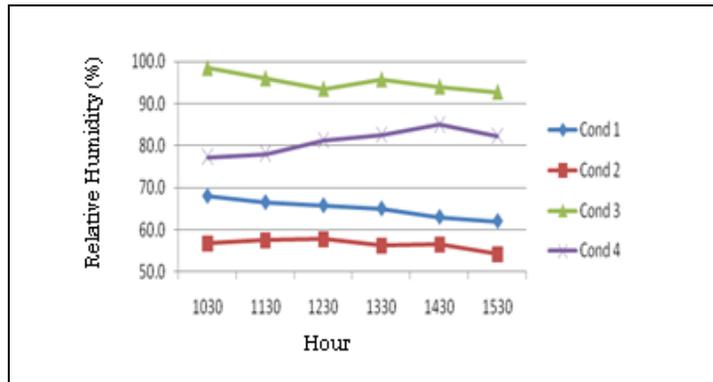


Figure 4: Relative Humidity

Figure 4 shows that the highest relative humidity is more than 90% occurred in Condition 3 when the humidifier provided followed by Condition 4 when both humidifier and ventilation holes provided. This condition agreed as the function of humidifier is to increase the level of humidity within the area. However, humidity level should be controlled significantly as high moisture content will influence the productivity of Swiftlet nest. Lower moisture content occurred in Condition 1 and 2, which is below 68% and this will cause damage or drop of Swiftlet nest as it could not stick to dry environment. The highest humidity found is 98.5% in Condition 3 and the lowest is 54.3% in Condition 2. Condition 4 is the best among all and it is in the allowable range of relative humidity for a suitable habitat for Swiftlet farming.

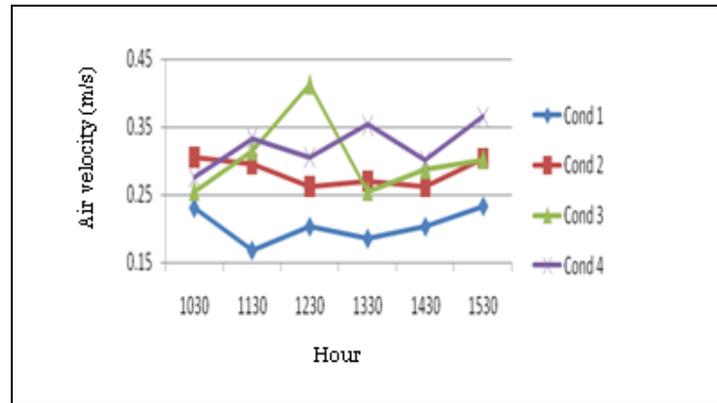


Figure 5: Air Velocity

Figure 5 shows that the highest air velocity, 0.41m/s achieved during the Condition 3 at 12.30 p.m and the lowest velocity was at 0.17 m/s during the Condition 1. The range of acceptable air velocity is between 0.20 m/s to 1 m/s in order to facilitate evaporation process in the building.

Table 1: Light Intensity

Time	Location (Internal entrance)	LUX
0800 – 1200	Southwest	10.2
	Southeast	0.8
1200 - 1800	Southwest	0.9
	Southeast	12.4

Entrance hole is the only source of lighting into the building. Most of the openings including windows and doors were closed or covered to shield away any intruding light source. Table 1 shows that the maximum light intensity in the morning is 10.2 LUX at Southwest orientation at the internal entrance and maximum light intensity in the afternoon is 12.4 LUX at the Southeast orientation.

## 5. DISCUSSION

### i. Condition 1 (Building Fully Closed)

In the first experiment, building was fully closed. Direct solar radiation falling on the external facade was rapidly absorbed by the structures causing high external surface temperatures. The heat transmitted into the building and elevated the internal temperature.

Data presented in figure 3 shows that in the absence of air movement in the building, air temperatures exceeded 37°C at all the measurement points. Figure 5 shows that the air velocity in the house is very low at around 0.15m/s due to building being fully closed. This situation is totally unsuitable for Swiftlet habitation. Swiftlet have their comfortable range of temperature from 26°C to 35°C and relative humidity from 75% to 90% for breeding and habitation. The lowest temperature is 29°C and the highest temperature is almost 38°C. The lowest relative humidity is 63% and the highest humidity is 68% (figure 4). Swiftlet will feel uncomfortable with high temperature and this condition will cause damages on Swiftlet egg. Lower relative humidity also dried out Swiftlet nest as it is made from Swiftlet's saliva. This will cause cracking of the Swiftlet nest. Deformed nest is not only being the lowest class nest at the market but it also affected the young Swiftlets and the eggs because shrank nest could not support them and will fall on the ground easily.

**ii. Condition 2 (Ventilation holes provided)**

Only ventilation holes were provided in this situation. Air temperature is slightly lower than Condition 1 when air movement is allowed to enter the area. Air velocity in Condition 2 is slightly higher compared to Condition 1. Evaporation process occurred when air movement was available in the building. It also reduced the level of relative humidity and air temperature inside the building. It is important to maintain the air temperature and relative humidity within the suitable range. Young Swiftlet are featherless therefore higher air velocity will affect their health.

**iii. Condition 3 (The humidifier Installed)**

The humidifier was provided in Condition 3 and ventilation holes are closed. The purpose of providing humidifier is to increase the internal relative humidity and decrease the air temperature level. It is recorded that the range of air temperature is between 25.5°C to 29°C and relative humidity is between 90 to 100%. In Condition 3, humidifier had been well controlled. However, evaporation process decreased dramatically due to the absent of air movement when the ventilation holes are closed. High moisture content within internal environment breeds fungus on nest planks and lead to longer hardening time for birds nest. This will affect the productivity of Swiftlet nest.

**iv. Condition 4 (Ventilation holes and humidifier provided)**

When ventilation holes are provided with humidifier, Condition 4 shows the suitable habitat for Swiftlet farming. The air temperature and relative humidity of the building could be controlled significantly. Result obtained from Condition 4 shows that most of the parameters are within desirable range. The air temperature is between 26.5°C to 33.8°C and relative humidity is between 75% to 80%. Humidifier had been controlled to reach the desirable range of relative humidity. Light intensity is from 0.8 to 12.4 LUX and should be kept below 5 LUX. A much improved air movement is generated throughout most of the farm house when ventilation holes are provided with air velocities increasing to 2.5 m/s and reduce the humidity level. The quantity of ventilation holes must be standardised and 'elbow' pipe normally being used as ventilation system as it could allow air flow while preventing the direct exposure towards the sunlight.

**6. CONCLUSION AND RECOMMENDATION**

Evaluation on the suitable environment for Swiftlet farming was conducted successfully. Four main factors to be concerned in providing suitable habitat for Swiftlet farming are air temperature, relative humidity, air velocity and light intensity. The recommended range of temperature is between 26°C to 35°C. Low air temperature would reduce the productivity of Swiftlet nest. Swiftlet entrance should be constructed at South North orientation to avoid direct sunlight exposure which will cause the increment of internal temperature and the light intensity. Additional layer of agricultural netting to surface wall may also decrease the surface temperature.

Relative humidity in the range of 80% and 90% is recommended to maximize the productivity of Swiftlet nest. Higher relative humidity breeds fungus on nesting plank and dampness leads to stagnant water pools and lead to mosquito breeding. Swiftlet will not build their nest on fungus plank. Therefore, humidifier should be provided to control the desirable range of relative humidity.

Air Ventilation is crucial in Swiftlet farming in order to provide air movement in the building. 'L-elbow' pipe connector is recommended as a component to promote air movement. This type of component could prevent the direct exposure towards the sunlight. Distance between the ventilation holes is recommended at a minimum of 1m from nesting plank level and constructed at walls that are opposite to the direction of nesting planks. Installation of exhaust fan to ventilation wall is recommended to promote the ventilation and at the same time controlling the evaporation process.

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