



# ULU MUDA FOREST RESERVES ECOSYSTEM SERVICES: POLLINATION

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## INTRODUCTION

Pollination is ecosystem services that clearly benefit the national economy. About two-thirds of the world's plant species including cultivars require animal pollination. Globally, important crops benefit from pollination services of nearby forests or other natural habitats, which provide fodder and nesting space for pollinators. With the importance of pollination services to food resources, food security, economic resources then the evaluation of this service should also be acknowledged. About 70% of tropical crops seem to have at least one variety for which production is improved by animal pollinators (Roubik, 1995). Most common pollinators live naturally in the forest ecosystem known as wild pollinators.

Hence, the objective of this paper is to assess the economic value of pollination services provided by Ulu Muda forest reserves (FR) to the surrounding agricultural production.

## MATERIALS & METHODS

The secondary data consisting of publication reports on the agricultural statistics and field agriculture. For consistency, we used agriculture statistics data published by Kedah's Department of Agriculture. The information obtained were (i) district area, (ii) plot area (ha), (iii) types of plants, (iv) total production (kg) and (v) production value (RM). Here, we take into consideration three districts which Ulu Muda FR located. Data for three districts evaluated were Sik, Baling and Padang Terap.

The analysis uses a market price, production function approach to calculate the economic value of pollination effects. The total economic value of pollination (IPEV) is calculated as follows (Gallai et al., 2009):

$$IPEV = \sum_{i=1}^n \sum_{j=1}^m (P_{ij} \times Q_{ij} \times D_{ij})$$

Where  $Q_{ij}$  is the production quantity,  $D_{ij}$  is the ratio of the dependence of crop  $i$  to the pollinator and  $P_{ij}$  is the price of crop  $i$  per unit of production in area  $x$ .

## RESULTS

The dependence of tropical crops on pollen animals has been extensively studied Paul R.E & Duarte, 2011; Klien et al., 2007; Raubik, 1995 and Earl of Cranbrook, 1988). Klien et al. (2007) published the dependency ratio which the value of this ratio determines the average values of pollinator reliance on the crop. Some of the pollinator dependence ratio of Malaysia crops reported by Norowi et al. (2010).

The estimation for economic value of pollination services is estimated only for guava, durian, watermelon, mango and rambutan. Meanwhile, pollinators were shown to be important for dokong, jackfruits and pineapple, but the extent of the impacts is unknown. The results of economic value of pollination for Ulu Muda FR estimated as follow;

- Stages of dependency ratio
- 95%: the average value of reduction of pollen-driven yields is between 100% and 90% in experiments comparing commercial produce with and without animal pollinators. Pollination is reported as "Essential"
  - 65%: reduction of pollen driven revenue is between 40% and less than 90%. Pollination is reported as "Great"
  - 25%: reduction of pollen driven revenue is between 10% and less than 40%. Pollination is reported as "Modest"
  - 5%: reduction of pollen driven revenue is between 0% and less than 10%. Pollination is reported as "Little"
  - "Parthenocarpic" crops that are not dependent on animal pollination

No	Agriculture Type (Fruits)	Production Value (RM)	Dependency ratio	Economic Value (RM)
1	Durian	92,045,800.00	0.65	59,829,770.00
2	Guava	5,100.00	0.65	3,315.00
3	Mango	499,400.00	0.65	324,610.00
4	Rambutan	3,637,500.00	0.05	181,875.00
5	Watermelon	399,400.00	0.95	379,430.00
	Total	108,073,200.00		60,719,000.00 (56.18%)

Table 1 Calculation of economic valuation of pollination for Ulu Muda FR

The economic value of pollination services provided by Ulu Muda FR, is about RM 60,719,000 which is equal to 56% of the total production value of the area. The actual value of this service will probably be higher than reported in the findings if other types of crops are considered.

## CONCLUSION

Ulu Muda FR plays an important role to surrounding area as it serves as habitat/nesting area for pollinator species. It also serves as one of the genetic sources if in the future pollinator species show a genetic decline that will indirectly affect the crop's production.

The economic value of pollination services Ulu Muda FR, equal to 56% of the total production value of the area. Hence, the contribution of pollination services towards the production of crops are significant and valuable.

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