

## ***ECONOMIC VALUATION OF THE MOLUCCAN ECLECTUS BASED ON MARKET PRICE AND MAINTENANCE COST APPROACH***

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### **ABSTRACT**

*Illegal wildlife trade is a criminal act of enormous value, almost equivalent to drug trafficking. One species vulnerable to being traded illegally is the moluccan eclectus which has a high number of enthusiasts. Law enforcement in cases of illegal wildlife trade in Indonesia is difficult because there is no standardization in calculating the economic value of wild animals. The economic valuation approach is one approach in quantifying the economic value of wildlife. This study aims to analyze the economic value of moluccan eclectus based on the market price approach, analyze the economic value of moluccan eclectus based on the maintenance cost approach, and compare the two approaches in the economic valuation of moluccan eclectus. Data were collected by two methods, namely literature study and interviews. The literature study collects data in the form of moluccan eclectus market prices circulating in the domestic and international markets. Meanwhile, interviews were conducted with managers of conservation institutions at Siantar Zoo, Medan Zoo, Tasikoki Animal Rescue Center (PPS) Manado, Taman Mini Indonesia Indah Bird Park in Jakarta, Kekewang Zoo in North Sulawesi, and Andy Hoo Captivity in East Java to obtain data on maintenance cost. Data analysis was carried out quantitatively and qualitatively. The results showed that the economic value of moluccan eclectus based on the market price approach reached IDR 16,138,820/individual. Meanwhile, based on the maintenance cost approach, the economic value of moluccan eclectus reaches IDR 6,313,333/individual. Based on the accuracy of the results, both approaches have the same level of accuracy. Meanwhile, based on the effectiveness and cost-efficient aspects of data collection and analysis, the market price approach is relatively better than the maintenance cost approach.*

Key words: Economic valuation, illegal wildlife trade, moluccan eclectus

### **INTRODUCTION**

The illegal global trade in wildlife shows a fantastic value, estimated at US\$ 20 billion (Santos et al., 2011), and is second only to drug trafficking (Rosen and Smith, 2010). In Indonesia, the illegal wildlife trade is very vulnerable due to high demand from the Japanese, European, and United States markets for countries in Southeast Asia (Nijman, 2010; Rosen and Smith, 2010; Baker et al., 2013). One species that is vulnerable to being traded illegally is the moluccan eclectus. This species is a type of parrot that is used as a pet with a high number of enthusiasts and is traded in national and international illegal markets (Widodo, 2005; Setiyani and Ahmadi, 2020).

Law enforcement in cases of illegal wildlife trade in Indonesia is difficult. One of the reasons is that there is no standardization in calculating the economic value of wildlife (Chardonnet et al., 2002). Currently, the authorities already have guidelines in law enforcement cases of crimes against wildlife, which refer to Law of The Republic of Indonesia Number 5 of 1990 Article 40 paragraph (2), but the implementation has not been maximized. This is because the regulation applies to all cases without considering sanctions per species and per individual animal. The regulation views every case equally. Each case is subject to a maximum imprisonment of five years and a maximum fine of IDR 100,000,000.00, so that generalizations occur for all cases and are considered less effective.

The economic valuation approach is one approach in quantifying the economic value of wildlife. Various economic valuation approaches can be used, including the market price approach and maintenance cost. The result of the economic valuation is the economic value of wildlife, which can be used as a basis for determining the number of fines and lawsuits for crimes against wildlife, especially illegal trade. The purpose of this study was to analyze the economic value of moluccan eclectus based on the market price approach, analyze the economic value of moluccan eclectus based on the maintenance cost approach, and compare the two approaches in the economic valuation of moluccan eclectus.

### **RESEARCH METHOD**

The research was carried out in two stages. The first stage was carried out from January to March 2020 to obtain data on maintenance cost. The second stage is carried out from February 2021 to May 2021 to obtain market price data. Data collection on maintenance cost was carried out at Siantar Zoo, Medan Zoo, Tasikoki Animal Rescue Center (PPS) Manado, Taman Mini Indonesia Indah Bird Park in Jakarta, Kekewang Zoo in North Sulawesi, and Andy Hoo Captivity in East Java. Meanwhile, market price data was obtained through searching articles from various sources, such as journals and mass media.

Data were collected by two methods, namely literature study and interviews. The literature study

collects data in moluccan eclectus market prices circulating in the domestic and international markets. The literature study was conducted by tracing the market price of moluccan eclectus obtained from the mass media and journals. The second data collection method was interviews with managers of conservation institutions at Siantar Zoo, Medan Zoo, Tasikoki Animal Rescue Center (PPS) Manado, Taman Mini Indonesia Indah Bird Park in Jakarta, Kekewang Zoo in North Sulawesi, and Andy Hoo Captivity in East Java. Interviews were conducted to obtain data of maintenance cost.

Data analysis regarding the market price approach is carried out based on the following formula:

$$AMP_x = \frac{\sum_{i=1}^n x_i}{nx} = \frac{x_1+x_2+...+x_n}{nx}$$

$$= \frac{\sum_{i=1}^n RHP_x * nx}{\sum_{i=1}^n n}$$

WAMP =

$$WMV = WAMP + (X1 + X2 + X3 + X4 + X5) \times WAMP$$

Description:

- AMP<sub>x</sub> = Average market price of x (x = domestic or international)
- WAMP = Weighted average market price
- x<sub>i</sub> = Market price *i*
- n = Total data overall
- nx = Total data of x market (x = domestic or international)
- WMV = Wildlife market value
- X1, X2, ... , X5 = Weighting variable factors

The weighting variable factors used in this analysis refers to the Ditjen PHKA (2012), presented in Table 1.

International market prices are converted first in order to equalize the value of domestic and international purchasing power. According to Rahutami (2011), certain commodities tend to have the same price worldwide when measured in the same currency. The

calculation is done using the ratio of domestic prices to foreign prices. We use gasoline in our analyses because gasoline is a common commodity used worldwide, making it easier to convert. Conversion of animal market prices in international market is calculated using the following formula:

$$\frac{A \times B}{C}$$

Description:

- A = Animals price in location A in year t
- B = Gasoline price in Indonesia in year t
- C = Gasoline price in location A in year t

Meanwhile, maintenance costs are calculated using the following formula:

$$RCi = a + b + c + d$$

$$\frac{\sum_{i=1}^n PCi}{n}$$

ARC =

$$WEV = ARC \times Y$$

Description:

- a = Infrastructure/cage cost
- b = Feed cost
- c = Health maintenance cost
- d = Wage of animal keeper
- ARC = Average maintenance cost
- RC<sub>i</sub> = Maintenance cost in institution *i*
- n = Number of conservation institution
- WEV = Wildlife economic value
- Y = Total year of maintenance period

Both approaches to economic valuation will be subjected to comparative descriptive analysis to determine the best approach based on aspects of data collection effectiveness, accuracy of results, and cost efficiency of data collection.

Table 1 Weighting variable factors of wildlife

No	Weighting Factors	Description	Score
1	Endemicity (X1)	Endemic	1
		Non Endemic	0
2	Conservation Status (X2)	IUCN red list Critically Endangered (CR)	0,75
		IUCN red list Endangered (EN)	0,50
		IUCN red list Vulnerable (VU)	0,25
		Minister of Environment and Forestry's Regulation of the Republic of Indonesia Number P.106/Menlhk/Setjen/Kum.1/12/2018	0,25
3	Icon (X3)	Country	0,50
		Province/District	0,25
4	World's Heritage (X4)	World's Heritage	0,50
		Non World's Heritage	0
5	Reproduction Difficulty Level (X5)	Easy	0
		Difficult	0,75

## RESULT AND DISCUSSION

### 1. *The Economic Value of Moluccan Eclectus Parrot Based On Market Price Approach*

The market price approach is obtained by tracing the market price set in a transaction between the seller and the buyer. Differences in location, time, and the agreement between the seller and the buyer affect the price of moluccan eclectus in the illegal wildlife market. There are variations in the price of moluccan eclectus, both in the domestic and international markets, which are presented in Table 2. Price variations occur because they are determined by the interaction of supply and demand (Merwe et al., 2004).

Table 2 shows that the domestic price of moluccan eclectus varies from the lowest of IDR 150,000 and the highest of IDR 1,500,000 with an average domestic price of IDR 707,143. Moluccan eclectus international prices are more expensive than domestic prices. The lowest price in the international market reached IDR 1,383,935, and the highest price was IDR 32,298,750, with the average international price reaching IDR 16,282,022. The weighted average market price of moluccan eclectus is IDR 5,379,607. Moluccan eclectus's highest price is obtained from a search on one of the websites available in the United States. This country is a large-scale importer of legal and illegal wildlife, mainly from the

aves group (Eskew et al., 2020). Moluccan eclectus allegedly arrived in the United States market by being imported from the Philippines, where the Philippines is a transit destination for parrots sent from the Maluku Islands. The Philippines is among the top five countries that export animals to the United States market (Wyler and Sheikh, 2008).

The weighted average market price of moluccan eclectus is then weighted by a weighting factor consisting of endemicity, conservation status, icons, world's heritage, and level of reproductive difficulty, presented in Table 3. The moluccan eclectus is an endemic species of the Maluku Islands (BirdLife International, 2019), so it is given a score of 1 on the endemicity aspect. According to the Minister of Environment and Forestry's Regulation (2018), the moluccan eclectus is protected; it is given a value of 0.25. Based on the weighting factors in the form of icons and the world's heritage, moluccan eclectus do not include animals used as icons and the world's heritage so that they are given a value of 0. The next weighting factor is the level of reproductive difficulty. Moluccan eclectus has a low reproductive rate (Heinsohn and Legge, 2003), so it is given a value of 0.75. Based on the consideration of the weighting factor, it was found that the economic value of moluccan eclectus reached IDR 16,138,820.

Table 2 Price variations of moluccan eclectus in domestic and international market.

No	Domestic Market			International Market		
	Domestic Price (IDR)	Location	Year	International Price (IDR)	Location	Year
1	150.000	Morotai	2018	1.383.935	Philippines	2021
2	400.000	Surabaya	2020	15.163.380	Thailand	2016
3	500.000	Manado	2016	32.298.750	United States	2021
4	750.000	Jember	2017			
5	800.000	Surabaya	2019			
6	850.000	Malang	2020			
7	1.500.000	Pasuruan	2021			
	Average of domestic market	707.143		Average of international market	16.282.022	
	Weighted average of market price		5.379.607			

Table 3 The economic value of moluccan eclectus based on market price approach

No	Weighting Factors					
	Endemicity	Conservation Status	Icon	World's Heritage	Level of Reproductive Difficulty	
1	1	0.25	0	0	0.75	
2	Weighted average of both domestic and international market			IDR 5,379,607		
3	Economic value of moluccan eclectus based on market price approach			IDR 16,138,820		

Based on Table 3, it is found that the economic value of moluccan eclectus is higher than all prices found in the domestic market and mainly in the international market. This economic value can be considered in determining the value of the fine. Several countries have implemented wildlife crime fines based on market value. In Denmark, fines are two to three times market value (Hvilsted and Buchholt, 2001), Italy is four to six times market value (Cirelli, 2001), Spain is two to four times market value (Barreira, 2001). In Indonesia, law enforcement efforts are still not optimal, as indicated by the low nominal fines imposed on perpetrators (Table 4).

Based on Table 4, most of the perpetrators of the illegal trade in moluccan eclectus were sentenced to inappropriate sanctions, so they did not provide a deterrent effect. Based on the market price approach, the nominal fine is still far below the moluccan eclectus's economic value. In addition, Table 4 shows that prison sentences and fines have not been determined as punishments considering the sanctions per 1 individual moluccan eclectus. For example, in the case that occurred in Tidore in 2019 with 1 individual moluccan eclectus and the case in North Halmahera in 2020 with 3 individuals moluccan eclectus, both perpetrators were

sentenced to the same fine, which was IDR 5,000,000 each. Criminal sanctions in several countries show low sanctions so that they are not able to provide a deterrent effect for perpetrators and cause wildlife crime to continue to occur (Sina et al., 2016)

**2. The Economic Value of Moluccan Eclectus Parrot Based on Maintenance Cost Approach**

Wildlife conservation can be done in two ways, namely in-situ and ex-situ. Ex-situ conservation is an activity to conserve biological natural resources outside their natural habitat and maintain genetic integrity (Dulloo et al., 2010). Conservation institutions can conduct ex-situ conservation, such as safari parks, zoos, animal rescue centres, animal parks, and animal rehabilitation centres. Conservation institutions that carry out ex-situ conservation efforts certainly require funds to be used to ensure animal welfare. Animal welfare is closely related to the success of animal breeding (Poole et al., 1999), so this aspect should not be neglected for animals to remain sustainable. The cost of maintaining parrots at each conservation institution is presented in Table 5.

Table 4 Examples of some cases and sanctions of illegal moluccan eclectus trade

No	Location	Year	Number of Animal	Prison Length	Fine (IDR)
1	North Halmahera	2019	25 individuals moluccan eclectus and 3 other species	5 month	3,000,000
2	North Halmahera	2020	3 individuals moluccan eclectus and 3 other species	9 month	5,000,000
3	Tidore	2019	1 individual moluccan eclectus and 3 other species	4 month	5,000,000
4	Gresik	2020	4 individuals moluccan eclectus and 9 other species	6 month	10,000,000
5	Pati	2018	3 individuals moluccan eclectus and 2 other species	3 month	500,000
6	Tidore	2019	4 individuals moluccan eclectus and 2 other species	7 month	10,000,000
7	Sidoarjo	2018	3 individuals moluccan eclectus and 7 other species	6 month	2,000,000
8	Surabaya	2020	1 individual moluccan eclectus and 1 other species	12 month	1,000,000
9	Malang	2017	1 individual moluccan eclectus and 1 other species	6 month	2,000,000
10	Bandar Lampung	2019	2 individuals moluccan eclectus and 5 other species	18 month	50,000,000

Table 5 The economic value of moluccan eclectus parrot based on maintenance cost

No	Maintenance cost components	Maintenance cost per individual per year in conservation institutions (x 1000)					
		Siantar Zoo	Medan Zoo	PPS Tasikok-i Manado	TMII Bird Park Jakarta	Kekewa-ng Zoo North Sulawesi	Andy Hoo Captivity East Java
1	Infrastructure/cage	280	450	210	1,100	210	600
2	Feed	7,200	7,200	2,400	3,600	2,400	2,400
3	Health maintenance	150	150	60	120	60	150
4	Wage of Animal Keeper	2,100	1,800	1,920	1,800	1,500	1,020
Total		9,730	9,600	4,590	5,620	4,170	4,170
Average (economic value based on the total cost of maintenance for one year)		6,313,333					

Components of maintenance cost include infrastructure or cages, feed, health care, and animal keeper wages. The results showed that the cost of keeping moluccan eclectus varied at each location. The cost of maintenance moluccan eclectus cages at PPS Tasikoki Manado and Kekewang Zoo in North Sulawesi is IDR 2,100,000 each, Siantar Zoo is IDR 2,800,000, Medan Zoo is IDR 4,500,000, Andy Hoo's Captivity in East Java is IDR 6,000,000, and TMII Bird Park is IDR 1,000,000. The highest nominal is found in the TMII Bird Park, influenced by the size of the cage, which is larger than other locations. In addition, cage enrichment is also considered to be better than other locations. Enrichment of the cage consisted of providing perches (Sans et al., 2012; Ohara et al., 2015), providing sand trays, vegetable materials, and hanging objects (Ohara et al., 2015). Enrichment of cages requires costs, both in the form of capital and management (Jones et al., 2020), affecting the number of maintenance cost compared to cages with little or no enrichment.

Based on the maintenance cost on the moluccan eclectus feed component, it was found that the cost at Siantar Zoo was IDR 7,200,000, Medan Zoo was IDR 7,200,000, PPS Tasikoki Manado was IDR 2,400,000, Kekewang Zoo was IDR 2,400,000, TMII Bird Park was IDR IDR 3,600,000, Andy Hoo Captivity in East Java was IDR 2,400,000. There are similar costs incurred by conservation agencies located close together, such as Siantar Zoo and Medan Zoo in North Sumatra, and PPS Tasikoki Manado and Kekewang Zoo in North Sulawesi. This is influenced by the tendency of similar prices of fruit and grains in adjacent areas. Most moluccan eclectus feed on fruit and seeds (Rachmatika et al., 2020). Overall, the maintenance cost of the feed component shows a greater value than the other components. Food is an energy source for growth, reproduction, and daily activities (Cabana et al., 2017).

The next component of maintenance cost is health care costs. The health aspect is one aspect that is very concerned because it is related to animal welfare. The

### 3. Comparison of Market Price and Maintenance Cost Approach

The calculation of the economic value of wildlife is carried out using several approaches to obtain the best approach based on the aspects of data collection effectiveness, the accuracy of results, and the cost-efficiency of data collection. Each approach has

cost at PPS Tasikoki Manado and Kekewang Zoo is IDR 60,000 each, while at TMII Bird Park is IDR 120,000. The highest nominal is found at Siantar Zoo, Medan Zoo, and Andy Hoo Captivity in East Java, which is IDR 150,000. The nominal issued for moluccan eclectus health shows the lowest value compared to other components such as infrastructure/cages, feed, and animal keeper wages. This is because these costs are only incurred at any time when the animal is sick, or its prevention is routinely per unit of time.

The last component of maintenance cost is animal keeper wages. The results showed that the wages of moluccan eclectus keepers at Siantar Zoo were IDR 2,100,000/individual/year, Medan Zoo was IDR 1,800,000/individual/year, PPS Tasikoki Manado was IDR 1,920,000/individual/year, TMII Bird Park was IDR 1,800,000/individual/year, Kekewang Zoo reached IDR 1,500,000/individual/year and Andy Hoo Captivity in East Java was IDR 1,020,000/individual/year. The role of the animal keeper is closely related to the relationship and interaction between animals and humans (Carlstead, 2009), so that animal keeper is something that cannot be separated from animal care. Animal keepers must have high skills in caring for, improving welfare, and reducing animal stress (Ward and Melfi, 2015).

Based on the consideration of four aspects, namely infrastructure/cages, feed, health care, and animal keeper wages, the moluccan eclectus's economic value is obtained based on a maintenance cost approach. The results showed that the economic value of moluccan eclectus based on maintenance cost was IDR 6,313.333/individual/year. The economic value of moluccan eclectus is calculated within one year, which is IDR 6,313,333. One year is when parrots reach commercial, economic value as a traded commodity and reach maturity for reproduction. The magnitude of the economic value based on the maintenance cost illustrates that the moluccan eclectus is economically precious and supported by its status as a protected species and is being threatened due to illegal trade.

advantages and disadvantages, so researchers have the right to determine which approach is more feasible to choose (Scwermer, 2012). This study uses the market price and maintenance cost approach to obtain a comparison. The comparison of the two moluccan eclectus economic valuation approaches is presented in Table 6.

Table 6 Comparison of the two economic valuation approaches.

No	Economic Valuation Approach	Aspects		
		Effectiveness of Data Collection	Accuracy of results	Cost-efficiency of Data Collection
1	Market price	Good	Good	Good
2	Maintenance cost	Pretty good	Pretty good	Pretty good

Table 6 shows that the market price approach is a better approach than the maintenance cost approach. Based on the effectiveness of data collection and analysis, the market price approach is considered easy compared to maintenance cost because the data collection process is not as complex as the maintenance cost. The maintenance cost approach tends to be more complex due to the large number of components being assessed. In addition, the data collection process must also be carried out carefully. This is because interviews must be conducted with resource persons who are very familiar with all the components of the required maintenance costs.

Based on the accuracy of the results, the market price and maintenance cost approaches have both excellent accuracy. The market price approach is the price agreed by the seller and the buyer, so the market price is the actual value of moluccan eclectus, even though the market value is carried out through illegal trade. This absolute value makes the market price approach as an approach that has a high level of accuracy. Meanwhile, the maintenance cost are the actual

costs incurred by conservation institution to raise animals for one year. This shows that the maintenance cost approach has a high level of accuracy because it is based on the actual value.

The cost efficiency aspect of data collection shows that the market price approach has a better efficiency level than the maintenance cost approach. The market price approach does not require a lot of money because data collection can be done by searching through various media, such as literature studies, the internet, or direct surveys to various markets. Meanwhile, the maintenance cost approach can be made with two options, namely literature studies and direct surveys to animal care locations. The costs incurred in the maintenance cost approach are relatively more than the market price approach. This is because, besides being carried out through library research and visiting various conservation/captive institutions, this approach is also relatively more expensive. After all, it uses surveyors with high qualifications. Besides that, the interviewees also have a better understanding of maintenance.

## CONCLUSION

The value of animals circulating in the illegal market shows a low value compared to the value based on economic valuations. The economic value of moluccan eclectus based on the market price approach reaches IDR 16,138,820/individual. Meanwhile, based on the maintenance cost approach, the economic value of moluccan eclectus reaches IDR 6,313,333/individual. Based on the effectiveness and cost-efficient aspects of data collection and analysis, the market price approach is relatively better than the maintenance cost approach. Based on the accuracy of the results, both approaches have the same level of accuracy.

## REFERENCES

- Baker SE, Cain R, Kesteren F Van, Zommers ZA, D’Cruze N, MacDonald DW. 2013. Rough trade: Animal welfare in the global wildlife trade. *Bioscience*. 63(12): 928–938.
- Barreira A. 2001. Enforcement of international wildlife trade controls in Spain. In: Anton M, Dragffy N, Pendry S, Young TR, editor. *Proceedings of the International Expert Workshop on the Enforcement of Wildlife Trade Controls in the EU*. Brussels, Gland, and Cambridge: TRAFFIC and IUCN. pg 210-223.
- BirdLife International. 2019. *Eclectus roratus: The IUCN Red List of Threatened Species 2019* [Internet]. <https://www.iucnredlist.org/species/155072212/155636053>. [Downloaded 2021 July 10]. Available at: <https://www.iucnredlist.org/species/155072212/155636053>.
- Cabana F, Dierenfeld E, Wirdateti W, Donati G, Nekarlis KAI. 2017. Slow Lorises (*Nycticebus* spp.) Really Are Slow: a Study of Food Passage Rates. *International Journal of Primatology*. 38(5): 900–913.
- Carlstead K. 2009. A Comparative approach to the study of Keeper-Animal Relationships in the zoo. *Zoo Biology*. 28(6): 589–608.
- Chardonnet P, Des Clers B, Fischer J, Gerhold R, Jori F, Lamarque F. 2002. The value of wildlife. *Revue Scientifique et Technique (International Office of Epizootics)*. 21(1): 15–51.
- Cirelli MT. 2001. Enforcement of international wildlife trade controls in Italy. In: Anton M, Dragffy N, Pendry S, Young TR, editor. *Proceedings of the International Expert Workshop on the Enforcement of Wildlife Trade Controls in the EU*. Brussels, Gland, and Cambridge: TRAFFIC and IUCN. pg 185-193.
- [Ditjen PHKA] Direktorat Jendral Perlindungan Hutan dan Konservasi Alam. 2012. *Laporan penelitian valuasi ekonomi jenis satwa liar dilindungi*. Jakarta: Ditjen PHKA KLHK.
- Dulloo ME, Hunter D, Borelli T. 2010. Ex situ and in situ conservation of agricultural biodiversity: Major advances and research needs. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca*. 38(2): 123–135.
- Eskew EA, White AM, Ross N, Smith KM, Smith KF, Rodriguez JP, Torrelío CZ, Karesh WB, Daszak P. 2020. United States wildlife and wildlife product imports from 2000-2014. *Scientific Data*. 7(1).
- Heinsohn R, Legge S. 2003. Breeding biology of the reverse-dichromatic, co-operative parrot *Eclectus roratus*. *Journal of Zoology*. 259(2): 197–208.
- Hvilsted P, Buchholt M. 2001. Enforcement of international wildlife trade controls in Denmark. In: Anton M, Dragffy N, Pendry S, Young TR, editor.

- Proceedings of the International Expert Workshop on the Enforcement of Wildlife Trade Controls in the EU*. Brussels, Gland, and Cambridge: TRAFFIC and IUCN. pg 118-127.
- Jones PJ, Tahamtani FM, Pedersen IJ, Niemi JK, Riber AB. 2020. The productivity and financial impacts of eight types of environmental enrichment for broiler chickens. *Animals*. 10(3): 1–14.
- Merwe VD, Saayman M, Krugell W. 2004. Factors that determine the price of game. *Koedoe*. 47(2): 105-113.
- Minister of Environment and Forestry's Regulation. 2018. *Perubahan kedua atas peraturan menteri lingkungan hidup dan kehutanan No. P.20/Menlhk/Setjen/Kum.1/6/2018 tentang Jenis Tumbuhan dan Satwa yang Dilindungi*. Jakarta: Kementerian Lingkungan Hidup dan Kehutanan.
- Nijman V. 2010. An overview of international wildlife trade from Southeast Asia. *Biodiversity and Conservation*. 19(4): 1101–1114.
- Ohara A, Oyakawa C, Yoshihara Y, Ninomiya S, Sato S. 2015. Effect of environmental enrichment on the behavior and welfare of Japanese broilers at a commercial farm. *The Journal of Poultry Science*. 52(4): 323–330.
- Poole T, Hubrecht R, Kirkwood JK. 1999. Marmosets and tamarins. In: Poole T and English P, editor. *The UFAW Handbook on the care and management of laboratory animals, 7<sup>th</sup> edition, volume I: Terrestrial Vertebrates*. Oxford: Blackwell Science. pg 559-573.
- Rachmatika R, Prijono SN, Sari AP, Suparno S. 2020. Chick growth and nutrient requirement during rearing period on eclectus parrot ( *Eclectus roratus* , Müller 1776) . *BIO Web of Conference*. 19(9): 00013.
- Rahutami AI. 2011. *Purchasing Power Parity: Teori dan Perkembangan Model Empiris*. Semarang: Universitas Katolik Soegijapranata.
- Rosen GE, Smith KF. 2010. Summarizing the evidence on the international trade in illegal wildlife. *Ecohealth*. 7(1): 24–32.
- Sans EC de O, Federici JF, Hammerschmidt J, Clemente HC, Dahlke F, Molento CFM. 2012. Environmental enrichment on the welfare of industrial broiler chickens. *Ciência Rural*. 44(10): 1867–1873.
- Santos A, Satchabut T, Vigo Trauco G. 2011. Do Wildlife Trade Bans Enhance or Undermine Conservation Efforts? *Applied Biodiversity Perspective Series*. 1(3): 1–15.
- Schwermer S. 2012. *Economic Valuation Methods: Annex A to "Economics Valuation of Enviromental Damage–Methodological Convention 2.0 for Estimates of Environmental Costs"*. Dessau: German Federal Environment Agency (UBA).
- Sina S, Gerstetter C, Porsch L, Roberts E, Smith LO, Klaas K, de Castillo TF. 2016. *Wildlife Crime*. Brussels: European Parliament.
- Setiyani AD, Ahmadi MA. 2020. An overview of illegal parrot trade in Maluku and north Maluku provinces. *Forest and Society*. 4(1): 48–60.
- Ward SJ, Melfi V. 2015. Keeper-animal interactions: Differences between the behaviour of zoo animals affect stockmanship. *PLoS One*. 10(10): 1–10.
- Widodo W. 2005. Perdagangan burung-burung paruh bengkok di Bali. *Berkala Penelitian Hayati*. 11(1): 31–37.
- Wyler LS, Sheikh PA. 2008. *International illegal trade in wildlife: Threats and US policy*. Washington DC: Congressional Research Service