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Economic values of conservation attribute options in Cameron Highlands

(Nilai-nilai ekonomi pilihan atribut pemuliharaan di Cameron Highlands)

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Abstract

Stakeholders and public nowadays are very keen to enjoy a healthy environment as a result of improvement in the standard of living and the increase in environmental consciousness among them. Activities such as deforestation, illegal logging and agricultural activities that harm the environment are not publicly supported, and few significant segments in the society are willing to take responsibilities in preserving their natural resources. However, the collectivism attitude in preserving the resources is still lacking and the monetary value that can be gained from the direct exploitation or depletion of the natural resources seems to be more profitable and advantageous for certain people. Is it worth to deplete the resources without sustaining it or is it better to exploit it in an appropriate and reasonable manner? This paper will discuss a case study of Cameron Highlands as internalising the issues and problems existed here, such as the disturbances of the biodiversity and it's ecosystems, the dimensions that contribute to the problems and the appropriate strategies to encounter that particular matters. Series of physical observations and discussions with the stakeholders have been done in order to obtain the important information and current problems existed in the area.

Introduction

Development issues in the highland areas are closely related to the clearance of forests or deforestation, conversion for agriculture, settlements and other forms of development. This situation has long been experienced by the highlands in Malaysia, especially in Cameron Highlands, Pahang. Directly, there will be changes in land use in the relevant areas and thus, affect the ecosystem and its environment. One of the most significant effects is changes in the weather parameters, especially the temperature, humidity and rainfall patterns. According to Meyer and Turner (1992) changing patterns of land use and its impact on the ecosystem is classified as a new form and is known as hybrid category, where a change in the function of the ecosystem are likely to alter the function of others.

In most of the tropical countries like Malaysia, the changes that occur in the tropical rainforest should be taken seriously in the context of the current world climate change. Biodiversity of tropical rainforest is considered as an imperative component in the mechanism of global climate change. It has the potential to become one of the

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carbon storage areas and a major contributor to oxygen and carbon dioxide (CO_2) in the world. Tropical rainforest is estimated to save approximately 40% of the world's total carbon (Malhi and Grace 2000). According to research and inverse modeling for the concentration of CO_2 in the atmosphere, researchers concluded that tropical rainforest ecosystem has the potential to absorb between 1 and 3 gigatone of carbon each year (Schimmel et al. 2001; Rodenbeck et al. 2003). This reflects the large role of tropical rainforest in the global carbon cycle.

According to Hofmann et al. (2006), the role of CO_2 as a greenhouse gas has long been known to be among the main cause of climate change. The deforestation of tropical rainforest covered up to 800 million ha of the world's surface area and occurring at a rate of 14 million ha per year (Pielke et al. 2007). Deforestation is one of the contributors to the production of greenhouse gases in the world. Therefore, any deforestation action on a large scale certainly will change the climate patterns not only locally, but also globally.

While the advancement of the agricultural sector is one of the main causes of the destruction of tropical forests, not all are detrimental, as the shrub, grazing, logging or reforestation, soil outdated and areas of shifting cultivation are the new resources for agricultural equipment (Gibbs et al. 2008). However, a variety of agricultural activities that are aggressive in Cameron Highlands such as large-scale agricultural farms and agricultural hillside are said to be the main contributor to natural disasters such as landslides and flash floods. These disasters have claimed several lives over the past four major floods recorded in Cameron Highlands, that is in the 1980s and 1990s, October 2013 and recently in November 2014. The development of agriculture has been identified as one of the main factors that contribute to the natural disasters around the world such as floods and landslides (Kenyon et al. 2008). *Table 1* below shows the changes of land use pattern in Cameron Highlands from 1990 to 2006.

The Department of Town and Country Planning in 2004, has released statistics that categorised the total area developed for agricultural activities based on the stages of the gradient. A total of over 42% of agricultural areas in Cameron Highlands cultivated on slopes greater than 25°, which is the maximum extent permitted by law. A total of 23.6% percent of the area are cultivated with gradients between 20° and 25° and the rest are cultivated in the areas with slopes less than 20°. *Table 2* shows that almost half of the agricultural companies have disobeyed the rules and guidelines regarding sloping crops established by the law. This is one of the factors that contributed to flood disasters that causes the huge amount of agricultural run-off during heavy rain, which then contributed to the negative impacts on the highlands landscape.

The impact of technological progress in agriculture and forestry depends on how fast the technological advances in agriculture can compete with the clearance of forests for agriculture activities. The development of agricultural technology that does not

Table 1. Pattern of land use in Cameron Highlands (1990 – 1996)

Land use categories	Land use (ha)			Difference (%)	
	1990	1996	2006	1990 – 1996	1996 – 2006
Town and area development	493	568	977	(98.17%)	(72.01%)
Farms, industrial equipment and others	4,942	6,728	8,772	(77.5%)	(30.38%)
Forest	62,991	60,897	58,535	(7.07%)	(3.88%)

Source: Department of Agriculture (2011)

Table 2. Gradient category for agricultural land in Cameron Highlands

Slope	Total area (%)
2° – 6°	3.85
6° – 12°	7.06
12° – 20°	23.08
20° – 25°	23.06
>25°	42.95

Source: Department of Town and Country Planning (2004)

require the opening of new land on a large scale can indirectly reduce the impact on the environment (Jayasuriya 2001). The efficient and sustainable management for agricultural activities in highland areas aimed at conserving natural resources, while allowing exploitation that does not destroy the function and its potential in helping humans and wildlife.

This equilibrium is hard to achieve for a tropical rainforest, especially in the highlands, where the effects of economic activities in the upstream area give more impact on the ecosystem in the downstream area and to the overall structure of highlands geography. Highland is vulnerable to the non-sustainable, exploitation and direct or indirect aggression land-use practices especially in zones with high economic value. This risk cannot be reduced effectively until an integrated management plan is implemented with the full support of all stakeholders – governments, civil society and the private sector (UNESCAP, ADB-UNEP 2012). Hence, this study was carried out to identify agricultural activities that contributes to flood in Cameron Highlands and to determine an efficient agricultural activities to be proposed for Cameron Highlands.

Study site

Cameron Highlands is the smallest district in the state of Pahang Darul Makmur. It is bordered on the north by Kelantan and west by Perak. The position is located between 4º20'N – 4º37'N and 101º20' – 101º36'E, including the Titiwangsa range. Cameron Highlands district has an estimated area of 71,218 ha. The surface is hilly and the highest peak, Mount Brinchang (2031 m), can be reached by road. Other mountains in the area – include Mount Swettenham (1961 m), Mount Siku (1916 m), Mount Beremban (1840 m), Mount Cantik (1802) and Gunung Jasar (1670 m).

Besides as a tourism attraction, Cameron Highlands is also well known as the producer of highland fine crops such as tea, fruits, vegetables and flowers that are rarely found elsewhere. Its cold and fresh weather that is very suitable for certain crops such as carnations and strawberries. Moderate climate conditioning plant can also be found in the highlands. The first Malay settlement is Kampung Taman Sedia, located in the valley between Tanah Rata and Brinchang. Locals and outsiders of the Cameron Highlands are heavily involved in ecotourism, agro-tourism and agriculture.

Hillside plants dominated most of the key areas in the highlands. It is estimated that over 5,800 ha of land were cultivated as arable land, while only about 3,300 ha of land are suitable for agriculture (Rahim and Samah 2012). Bertam Valley, Brinchang, and Terla River were occupied with farms that cultivate vegetables, fruits and flowers. Excessive exploitation of land for agricultural activities also contributed to the increase in temperature in Cameron Highlands. An increase in temperature at a rate of 0.1 °C to 0.9 °C is in line with logging activity, conversion for agriculture or other development (Ismail et al. 2011).

Northern highlands such as Kampung Raja that border with Lojing are also involved with agricultural activities. Most of these agricultural entrepreneurs occupied these areas by using the Temporary Occupation Licence (TOL) and through the exploration of illegal land use. Uncontrolled agricultural enterprises have led to more than 80 tons of soil entering the drainage water system such as rivers and other watersheds, there, reducing over 30% of

the water storage capacity in Cameron Highlands (Ngah et al. 2006).

In addition, the construction of hotels and residential areas are also estimated to grow by 3.2% per year and are mainly located in hilly areas (Ismail et al. 2011). This rapid development contributed to the problem of solid waste management. However, this problem has been solved to some extent in 2001 through privatisation of solid waste management to third parties. If this problem can be solved, the risk of flooding will definitely be reduced.

Development does not happen only in lowland areas, but it has spread to the highlands. Highlands is an area that is vulnerable to threats like floods and landslides. The highlands' uniqueness with its fauna and flora, unpolluted environment, clean air and away from the noise has begun to be vulnerable to environmental damage. Damage to the environment is affected by the rapid development in this area as an agricultural and tourist center of the highlands. It is important for researchers to identify the extent to which elements of the environment has affected agricultural activities, in spite of the rapid development in this area. This study was also conducted to generate data rather than the market value of Cameron Highlands so that policymakers can determine if the forest resources have been managed in the most desirable way from a social perspective.

In other words, the determination of the reasonable and relative management plan to the current plan also took the public views into account. This study showed the importance of information from a user's perspective to enable the policymakers to design a sustainable management system in Cameron Highlands. The public information about willingness to pay a service charge, allows local authorities to improve the management system and conservation efforts. The study is very important, as it aimed to identify and reduce the mismatch between the will of the public and the environmental services that are considered desirable to be implemented by the resource manager based on technical and commercial perspective.

Methodology

Qualitative and quantitative methods were used to obtain data. Direct interviews with local residents namely the *orang asli*, residences and farmers in Cameron Highlands was conducted to obtain information on agricultural activities carried out and the damages occurred in the highlands. The data and information from secondary sources such as scientific journals were also used to determine the level of contamination and deterioration of the ecosystem as a whole. While structured questionnaire was used to estimate the economic value of high soil studied. A structured questionnaire was designed and distributed to MARDI Agro Technology Park Cameron Highlands visitors. This park is one of the major tourist attractions in Cameron Highlands.

Convenience sampling was used to collect data by using the services of six trained enumerators. The sample size was chosen based on the size of the reference sampling by Sudman (1976) and factor analysis techniques to be used (Hair et al. 2006). A total of 200 questionnaires were distributed and the final data using the 194 respondents (97%) after data cleaning procedures were done. Choice Experiment (CE) was used to estimate the capacity for multi-attribute choice of using alternative sources and a small change in the nature of each individual utility.

CE method has the ability to produce estimation for various resource management options from a single application (Bennett and Blamey 2001). Estimating the economic value of the environmental improvement potential is important since resource managers are often concerned with small changes in the attribute level between the alternative management rather than had to cope with the loss or gain of environmental resources as a whole (Othman et al.

2004). This method has the flexibility to evaluate both the marginal characteristics of environmental and welfare impacts of alternative management options.

Instrument development

The descriptive analysis of biodiversity conservation and ecotourism facilities and services attributes used in this study are presented in *Table 3* and *Table 4* respectively. The CE was designed with the assumption that the observable utility function would follow a strictly additive form. Thus, for any specified model, it is expected that the sign of non-price attributes should be positive as shown in the column of both tables.

In sustainable agriculture attributes, it is expected that utility will increase with the improvement of higher level of foothill crops (FC), applied agricultural waste (AAW) and land use and deforestation (LUD) as shown in *Table 3*. For the price attribute with rational behaviour, the higher prices will lead to lower level of acceptance for any given improvement in the quality of sustainable agriculture. In other words, this negative sign reveals that cheaper environmental quality is preferred to rather then the more expensive one.

For the second block of ecotourism management attributes, it is expected that utility will increase with improvement of higher level of household development and hotel (HDH), agricultural waste management (AWM) and eco-friendly building (EFB), as shown in *Table 4*. For the price attributes for this block, entrance fee (EF) the higher prices will lead to lower level of acceptance for any given improvement in the quality of ecotourism management.

Different options were presented to respondents, distinguished by their attributes and associated cost. In sustainable agriculture block, Option A and B entail various combinations of conservation attributes with conservation charge to visitors, while Option C is referred to the status quo condition with no charge. It is the same with another block of ecotourism management which provides also 3 options of A, B and C, exactly the same with the first block condition.

In this study, the models are regressed by including coefficients for each level of the attributes to derive the best model. Each of the main attributes for both blocks is coded according to their levels. For example one of the HDH attribute level is coded as "no change" if respondents prefer the option among others. This shows that particular HDH attribute level is selected for changes in services. The status quo condition is identified as a base level, while level 2 and 3 are the improvement levels. Hence variables in the models are regressed to reveal differences in probabilities of option between base level and attribute levels.

Table 3. Expected priori sign for sustainable agriculture attributes

Attribute	Attribute level	Expected sign
Foothill crops (FC)	• No change • 20% decrease of the foothill crops • 30% decrease of the foothill crops	+
Applied agricultural waste (AAW)	• No change • 10% decrease the rest of applied agricultural waste • 20% decrease the rest of applied agriculture	+
Land use and deforestation (LUD)	• No change • 50% recovery of land use and deforestation • 100% recovery of land use and deforestation	+
Conservation charge (CC)	• RM0 • RM2 • RM5 • RM7	–

Table 4. Expected priori sign for ecotourism management attributes

Attribute	Attribute level	Expected sign
Household development and hotels (HDH)	• No change • Moderate hotel & residential development • Efficient hotel and residential development	+
Agricultural waste management (AWM)	• No change • Moderate increase in agricultural waste management system efficiency • Total increase in agricultural waste management system efficiency	+
Eco-friendly building (EFB)	• Amateur • 50% use of environmental friendly building materials • 100% use of environmental friendly building materials	+
Entrance fee (EF)	• RM0 • RM2 • RM5 • RM7	–

Results and discussion

There are several agricultural activities that have been identified as major contributors to the occurrence of a series of floods in Cameron Highlands. Among them is the use of agricultural waste runoff that enters the highland's water drainage system. Increased in silt had caused a reduction in capacity or the ability of the watersheds and river to accommodate large quantities of water at a time. The activities of land conversion from forest to agriculture, and land use on slopes of more than 25° is also among the factors. Rainwater runoff cannot be reduced with the loss of the natural buffers consist of trees and natural vegetation. *Table 5* shows agricultural activities and deterioration status in areas with different geographic structure in Cameron Highlands.

The development of upstream areas for agricultural activities and the development of infrastructure and building-construction lead to serious consequences in the downstream areas. Dumping sludge or agricultural waste, destroyed the aesthetics value of highlands, and the worse part is the change of its physical ecosystem. Temperatures at high altitude declined over time and is the ultimate concern to the agricultural industry if it is not well-regulated.

Table 5. Agricultural activities and deterioration status of Cameron Highlands

Activity	Slope	Forest	Settlement areas	Water catchment and river
1 The rest of the agricultural use[a]	High	N.A	Low	Critical
2 Conversion to agricultural land[b]	Critical	High	N.A	N.A
3 Climate change (°)[c]	High	Moderate	Critical	N.A
4 Agriculture hillside (> 25°)[d]	Critical	Critical	Low	High
5 Upstream development[b]	Critical	Moderate	High	High
Threat status for each character	Critical	Higher	Moderate	Higher

Note: Critical = prompt action; High = action immediately; Moderate = monitoring and actions; Low = monitoring; N.A = not applicable. The determination of the level of threat based on quantitative data and qualitative observations (interviews with farmers, physical observation and secondary sources)
Source: [a](Survey Data 2015); [b](Department of Agriculture 2011); [c](Ismail et al., 2011); [d](Rahim and Samah 2012)

Willingness to pay for attributes level

Utility is the level of individual satisfaction, as measured by the increase or decrease in the unit. Increase in one unit of utility, represents an increase of one unit of a person/individual satisfaction. The measurement of the utility unit can also estimate the increase in the monetary/ money that could be invested for the improvement of an attribute surveyed. The size of the utility will eventually form an estimation of line demand for a products or services, whether in the form of tangible or intangible.

The finding of this study used this utility unit measurement and the estimation of willingness to pay, in explaining the importance and value of an attribute that should be paid by respondents in order to enjoy that particular attribute increases. The Conditional Logit (CL) model was applied in this study. This section will present the simple conditional logit model to determine the willingness to pay for each attributes-level.

Sustainable agriculture

The model specification for conditional logit model incorporating levels for sustainable agriculture is stated as below:

$$\mathbf{U} = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \in o$$

Where:

$\mathbf{U}$ = Utility

$\beta_1 X_1$ = 20% decrease of the foothill crops 2 (FC2)

$\beta_2 X_2$ = 30% decrease of the foothill crops 3 (FC3)

$\beta_3 X_3$ = 10% decrease the rest of applied agricultural waste 2 (AAW2)

$\beta_4 X_4$ = 20% decrease the rest of applied agriculture (AAW3)

$\beta_5 X_5$ = 50% recovery of land use & deforestation 2 (LUD2)

$\beta_6 X_6$ = 100% recovery of land use & deforestation 3 (LUD3)

$\beta_7 X_7$ = Conservation charge (CC)

The parameters illustrate the importance of attributes and the levels in determining respondents' preferences in selecting the best alternative for improvement in sustainable agriculture in Cameron Highlands.

Based on *Table 6*, the study showed that 30% decline in agricultural activity in the hillside will increase the public utility by 1.72 units. However, the utility of respondents decreased in line with a 20% decline in agricultural activity in the hillside. This is likely to be based on the percentage reduction in FC2 that do not meet the demand of respondents who want a bigger margin changes. Decrease the amount of waste by 20% for agricultural use will also increases the public utility by 2.18 units.

Level of attributes that are offered to the respondents can be sorted by rank and level of interest:

- AAW2 – 20% decrease the rest of applied agricultural waste
- LUD3 – 100% recovery of illegal land and deforestation
- FC3 – 30% decrease of the foothill crops
- AAW3 – 20% decrease the rest of applied agricultural waste
- LUD2 – 50% recovery of land use & deforestation
- FC2 – 20% decrease of the foothill crops

Priority is being given to improve the public utilities that are most significant in line with the improvements for the attributes in Cameron Highlands as desired by the respondents in creating sustainable and efficient agricultural activities.

Table 7 shows the monetary value that available in line with the increase in each level of attribute as shown in *Table 6*. This value can be referred to the resource manager in Cameron Highlands in determining the costs to be incurred either by the government or through public funds like tax collection, an entrance or charge conservation. The results showed an increase in the monetary value that respondents for example, is willing to pay RM9.48 if 100% recovery of illegal LUD3 attribute can be

increased. The investment from the public in improving the attributes that contribute to a recovery of ecosystem function of Cameron Highlands is the result/earnings to the resources managers that could be used to improve these attributes.

Ecotourism management

The model specification for conditional logit model incorporating levels for sustainable agriculture is stated as below:

$$\mathbf{U} = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \in o$$

Where:

- $\mathbf{U}$ = Utility
- $\beta_1 X_1$ = Moderate hotel and residential development 2 (HDH2)
- $\beta_2 X_2$ = Efficient hotel and residential development 3 (HDH3)
- $\beta_3 X_3$ = Moderate increase in agricultural waste management system efficiency 2 (AWM2)
- $\beta_4 X_4$ = Total increase in agricultural waste management system efficiency 3 (AWM3)
- $\beta_5 X_5$ = 50% use of environmental friendly building materials 2 (EFB2)
- $\beta_6 X_6$ = 100% use of environmental friendly building materials 3 (EFB3)
- $\beta_7 X_7$ = CC

The above parameters illustrate the importance of ecotourism management attributes and their levels in determining respondents' preferences in selecting the best alternative for improvement in Cameron Highlands.

Based on *Table 8*, the result showed that the moderate plan for hotel and housing development would increase the public utility by 0.39 units. The efficient hotel and residential development will improve the efficiency of public utility by 1:34 units. A moderate increase in agricultural waste management system will improve public utilities as much as 1.76 units and the use of 100% of eco-friendly building materials will increase the public utilities by 1.82 units.

Level of attributes that are offered to the respondents can be sorted by rank and level of interest:

Table 6. Activity level attribute sustainable agriculture

Attribute	Coefficient	P [| Z |> z]
FC2	–0.42573400	0.0771
FC3	1.71629530	**
AAW2	2.18849375	**
AAW3	0.81702284	**
LUD2	0.66398656	**
LUD3	2.23201990	**
CC	–0.23545095	**

Note: **Significant at 1%, *Significant at 5%

Table 7. Marginal values for sustainable agriculture activity level attributes

Attribute	Coefficient	P [| Z |> z]
FC2	–1.80816430	0.0583
FC3	7.28939637	**
AAW2	9.29490307	**
AAW3	3.47003418	**
LUD2	2.82006320	**
LUD3	9.47976595	**

Note: **Significant at 1%, *Significant at 5%. Coefficient indicates an increase in the value of money (Ringgit Malaysia) for each increase in the level attributes in *Table 6*

Table 8. Level attributes ecotourism management

Attribute	Coefficient	P [| Z |> z]
HDH2	0.39171880	0.1284
HDH3	1.34353601	**
AWM 2	1.76270866	**
AWM 3	0.75655768	0.0396
EFB 2	1.21057535	**
EFB 3	1.82424343	**
Entrance fee	–0.18762377	**

Note: **Significant at 1%, *Significant at 5%

- EFB – use 100% of building materials environmentally friendly
- AWM2 – moderate increase in agricultural waste management system efficiency
- HDH3 – efficient hotel and residential development
- EFB2 – 50% use of environmental friendly building materials
- AWM3 – total increase in agricultural waste management system efficiency
- HDH2 – moderate hotel and residential development

Priority is given to the improvement of the most significant public utility in accordance with the will of respondents who want the attribute improvements in Cameron Highlands' area of study for the creation of an organised management and efficient eco-tourism.

Table 9 shows the monetary value which will be found in line with the increase in each level of attribute shown in the previous table. The results showed an increase in the monetary value that can be issued or the willingness to pay by respondents was RM9.72 if the use of 100% of EFB3 materials is increased. Investment from civil society in improving an attribute will streamline the management of ecotourism in Cameron Highlands. Monetary value invested, however, must provide a commensurate return to their improvement

Table 9. Marginal values for attributes level ecotourism management

Attribute	Coefficient	P [| Z |> z]
HDH 2	2.08778878	0.1695
HDH 3	7.16079850	**
AWM 2	9.39491124	**
AWM 3	4.03231255	0.0621
EFB2	6.45214277	**
EFB3	9.72288017	**

Note: **Significant at 1%, *Significant at 5%. Coefficient indicates an increase in the value of money (Ringgit Malaysia) for each increase in the level attributes in Table 8

in terms of attributes. This is to ensure the comfort and satisfaction level increase in line with any increase in eco-tourism infrastructure in Cameron Highlands.

The empirical findings is essential to ensure the highland's resources management planning is done responsibly and with full of integrity. Effective and efficient management of resources certainly have a positive impact on the development of Cameron Highlands and at once, preserve and conserve the environment and reduce the risk of disasters such as floods and others.

Recommendations

Flood risk that harms the lives and properties in Cameron Highlands can be prevented and reduced by the implementation of the following recommendations:

The new land use areas, especially for agricultural activities must comply with the rule of law that has been established in accordance with the Land Conservation Act 1960 (Act 385). Under this act any agricultural activities in areas with slopes exceeding 25° must be stopped. In addition, existing agricultural areas must comply with the Planning Guidelines for Preservation of Topography in Physical Planning and Development under the Town and Country Planning Act 1976 (Act 172) and the Free Development of Agriculture in the Land Slope.

The organic and environmentally friendly cultivation procedures must be developed efficiently and thoroughly by the agricultural agencies like MARDI and the Department of Agriculture with regard to aspects of environmental protection and concepts to maximise profits among farmers in Cameron Highlands. This is important because the use of sustainable agriculture practices with affordable costs itself can be an incentive to change from conventional farming practices towards sustainable agriculture (Rahim et al. 2011).

Law enforcement under the National Forestry Act, 1984 (Act 313) and Land

Conservation Act 1960 (Act 385) should be strengthened and strictly implemented. Existing legislation is sufficient to prevent activities that could damage the structure of geography and biodiversity of Cameron Highlands such as logging and the opening of new agricultural areas.

Close monitoring of Temporary Occupation License (TOL) should be carried out continuously. Violation of the terms and the law, especially related to the development of agriculture by farmers who use the TOL land, shall be punished and sentenced as immediate termination or non-renewal of their licenses.

Agricultural waste management also must be done in more systematic and well organised. Agricultural residues such as excess used of fertilisers, pesticides and land is among the key elements that contributed to the reduction of water retention capacity in the Cameron Highlands as reported by Ngah et al. (2006). Tasik Habu capabilities as a major water catchment area in Cameron Highlands have been reduced by 31% in 1990 and is expected to continue to decline.

The improvement of the attributes found in the study, with the cost of the customer's willingness to pay should be noted by the resource manager in Cameron Highlands. The empirical findings of the study can be considered for the highland development policy in the future. The development of costs liability system for the improvement of the characteristics of ecosystems and urban planning will able to ensure sustainable development of the Cameron Highlands.

Conclusion

The Cameron Highlands development, especially in agriculture and tourism are vital for economic growth especially in Pahang and the nation in general. Production of fresh agricultural products give high returns to the farmers and able to enhance the level of socio-economic community. However, serious attention and action must be taken to avoid the risk of floods that had taken many lives and properties over and over again. Terrain and highland's geography are very sensitive to any changes to the ecosystem functions especially places like Cameron Highlands. Extreme exploitation without considering the conservation elements might reduce the value of highland in the future as well as an impact on economic activity here. The chain of ecosystem function in biodiversity are closely interconnected in which, the failure of a function itself will inhibit other functions. Such this issue will cause floods and landslides in Cameron Highlands. Sustainable agriculture and environment are capable of preserving and conserving the highland so that the esthetic value can still be much enjoyed by the future generations.

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Abstrak

Pihak berkepentingan dan orang ramai pada masa kini sangat berminat untuk menikmati persekitaran yang sihat hasil daripada peningkatan taraf hidup dan kesedaran alam sekitar yang semakin meningkat di kalangan mereka. Aktiviti-aktiviti seperti penebangan hutan, pembalakan haram dan aktiviti pertanian yang merosakkan alam sekitar tidak disokong secara terbuka dan beberapa segmen yang signifikan dalam masyarakat sanggup bertanggungjawab dalam memelihara sumber semula jadi mereka. Walau bagaimanapun, sikap kolektivisme dalam memelihara sumber masih tidak banyak dan proaktif kerana nilai monetari yang boleh diperoleh daripada eksploitasi atau pengurangan langsung sumber semula jadi seolah-olah lebih menguntungkan dan berfaedah terutama bagi kumpulan-kumpulan tertentu. Adakah ia berbaloi untuk mengurangkan sumber-sumber tanpa usaha mengekalkannya atau adakah ia lebih baik untuk mengeksploitasinya dengan cara yang sesuai dan munasabah? Artikel ini akan membincangkan satu kajian kes di Cameron Highlands dengan mengambil kira isu dan masalah yang wujud seperti gangguan biodiversiti dan ekosistemnya, dimensi yang menyumbang kepada masalah-masalah tersebut dan menerangkan strategi yang sesuai untuk menghadapi permasalahan tersebut secara umum. Siri pemerhatian fizikal dan perbincangan dengan pihak-pihak berkepentingan telah dilakukan untuk mendapatkan maklumat penting dan masalah semasa yang wujud di kawasan itu.