Individual Differences in Sabahan Highland Farmers' Adaptation towards Climate Change

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Abstract
This paper discusses the individual differences in adaptation towards climate change among Sabahan highland farmers. This study is quantitative in nature in the form of a cross-sectional survey. Via a simple random sampling, a total of 200 highland farmers in Kundasang and Moyog were selected as respondents. The analysis performed has concluded that the differences in education achievement have a significant influence on Sabahan highland farmers' adaptation towards climate change, while factors such as age, income and the number of household members have a significant relationship with their adaptation towards climate change. A number of recommendations were highlighted and it is a hope that it can assist related parties in constructing a better community's adaptation plan.
Keywords: Climate Change, Highland Farmers, Adaptation Ability, Sustainable Agriculture.

Introduction
For over the past few decades, Malaysia's climate change has shown a rise in warming trend. The Southern part of Peninsular Malaysia recorded long dry periods, which results in the length of dry spells, while all the indices of wet spells in these areas showed a decreasing trend (Masud et al., 2015). In this respect, such scenario result in adverse effects such as advancement of plant maturity and source reduction coupled with poor sink strength (Mathauda et al., 2000). Furthermore, extreme events resulted from climate change increase the risks associated with farming activities. Farmers nowadays deal with frequent natural disasters such as landslides and flooding. As these impacts are expected to worsen in the future, adaptation towards it is seen as the best solution (McDowell & Hess., 2012). Adaptation towards climate change as defined by the Ministry of Natural Resources and Environment (2009) refers to 'the actions taken to help communities and ecosystems to cope with actual or expected impacts of climate change'. Then again, it should be noted that every individual have different adaptation abilities and such issue have become a major obstacle for the concerned parties in constructing concrete adaptation

strategies. Up to date, there is little understanding on which group can adapt better towards changing climate? Is it males, elderlies or university graduates who can adapt better during such disaster? The main aim of this study is related to this issue as it tries to examine at a specific level of community - the individual factors that influence Sabahan highland farmers' adaptation towards climate change. Within the scope of this study, the focus is placed on individual factors such as gender, form of employment status, education level, age, experience, income and number of household members.

Climate Change in Malaysia Perspective
Although Malaysia gained its independence for more than 50 years, the collected data sets on Malaysia climate change are only available for thirty years earlier. Intergovernmental Panel on Climatic Change (IPCC) had reported the same trend in temperature forecast for the next 100 years, they said that the global warming rate has increased in the last 30 years and will continue in the future (Wai et al., 2005).
Studies that have been conducted by IPCC before this had listed a few unprecedented problems that never occur in history before such as high temperatures, unstable rain indices, rising sea levels, frequent occurrences of floods, droughts, heat waves and tropical cyclones. One of the well-known affected areas in Peninsular Malaysia is the East Coast region. The East Coast region of Peninsular Malaysia consists of Kelantan, Terengganu, Pahang, and East Johor; these states have been associated with prominent providers of farming products in Malaysia (Shaffril et al., 2013).
Within this year, there are few questions raised regarding the effect of climate change in the Malaysian industrial sector. The issues of climate change are discussed mostly in the economic sector. Malaysian farmers' social and economic sustainability especially, are directly or indirectly affected by climatic factors. . Obstacles such as crop damage, low productivity and high production cost can induce deficits in income, higher poverty rates and seasonal unemployment rate among farmers during climate change. Poverty and income inequality in Malaysia exists mostly in the states with projected temperature and rainfall changes, such as Sabah (23%), Terengganu (15.4%), Kelantan (10.6%), Sarawak (7.5%), Kedah (7%), Perlis (6.3%), and Perak (4.9%). This group also has a relatively large number of household members and is actively engaged in agricultural activities, making them vulnerable to poverty (Alam et al., 2011).

Methodology
This study uses cross-sectional survey, which can be generalized as a quantitative research. Document analyses and series of instrument development meetings were conducted to develop the instrument, which was later used for the data collection process. The instrument's pre-test was conducted in Tanah Rata, Cameron Highland. Validation of the instrument was done via reliability analysis and the researchers improved the instrument.. Through a simple random sampling technique, Highland farmers in Kundasang and Moyog (Sabah states) were chosen as sample for this research.Towards the end, as a result a total of 200 respondents had been chosen. Trained and experienced enumerators had collected the research data while monitored by research team members. During the data collection process, an enumerator took between 20-35 minutes to complete each survey session. Descriptive analysis (frequency, percentage, mean

score) and inferential analysis (independent t-test, ANOVA, Pearson correlation) are the two types of analysis used in this research, SPSS application was used to analyze the collected data.

Results and Discussion

Table 1 demonstrates the respondents' demographic background. About 51.5% of the total respondents are female. The recorded mean score for age was 41.1 years; with more than quarter of the respondents (27.5%) included in the age group of 26-40 years old. Regarding their educational achievement, merely 7.5% of them received education at tertiary level, while in terms of marital status, nearly three quarters of the respondents (74.5%) was married. Furthermore, around 52.5% of them have seven or more household members. Approximately, 80.0% of the respondents were full-time farmers and on average they earned RM703.20 per month. The respondent's main crops grown were vegetables. It was noted that the majority of these highland farmers were experienced farmers as the mean score recorded for experience as a farmer was 18.9 years.

Table 1: Demographic Data of Sabahan Highland Farmers

Factor	Frequency	Percentage (%)	Mean scores
Gender			
Male	97	48.5	
Female	103	51.5	
Age			41.1
<25 years	40	20	
26-40 years	55	27.5	
41-50 years	62	31	
>51 years	43	21.5	
Educational achievement			
Never been to school	51	25.5	
Primary school	45	22.5	
Lower secondary school	25	12.5	
Upper secondary school	63	31.5	
Tertiary	15	7.5	
Marital status			
Single	42	21	
Married	149	74.5	
Divorced	9	4.5	
Household member			
1-3	39	19.5	
4-6	56	28	
>7	105	52.5	

Status			
Full time farmers	160	80	
Part timer	40	20	
Income per month (from agriculture activities)			RM703.20
<RM750	131	65.5	
>RM751	69	34.5	
Experience as a farmer (years)			18.5
<5	49	24.5	
6-15	54	27	
16-25	38	19	
>26	59	29.5	
Main crops			
Fruits	1	0.5	
Paddy	7	3.5	
Vegetables	192	96	

Sabahan Highland Farmers' Adaptation Capacity

Table 2 demonstrates the overall mean score of Sabahan highland farmers' adaptation capacity towards climate change. The level of mean score was joined by equally dividing the mean score into categories, namely low (mean score between 1.00-2.33), moderate (mean score between 2.34-3.67) and high (mean score between 3.68 – 5.00). The resulted mean score of 3.68 shows that a majority of the respondents possessed a high level of adaptation practices. The analysis confirmed that only 6.5% of the respondents possessed a low level of adaptation practices.

Table 2: Highland Farmers' Adaptation Practices Mean Score

Level	Frequency	Percentage	Mean score
			3.68
Low	13	6.5	
Moderate	70	35.0	
High	117	58.5	

Table 3 demonstrates specifically the mean score for each statement measuring highland farmer's adaptation practices. The highest mean score was recorded by the statement 'I can diversify my crops' (M = 4.51), followed by 'I would like to extend my farming land to harvest more crops (e.g. Floriculture, fertigation, landscape)' (M = 4.17) and I would like to learn new skills that are not related to agriculture (e.g. entrepreneurial, vocational) (M = 3.89). The lowest mean score was recorded by the statement 'If I want, I can get another job other than being a farmer with my educational background and skills' (M = 2.54).

Table 3: Highland Farmers' Adaptation Practices Statement

Statement	Mean scores
I can diversify my crops	4.51
I would like to extend my farming land to harvest more crops	4.17
I would like to learn new skills related to agricultural activities (e.g. Floriculture, fertigation, landscape)	4.01
I would like to learn new skills that are not related to agriculture (e.g. Entrepreneurial, vocational)	3.89
I encourage my wife/my children to work outside my field of employment in order to help improve our household income	3.34
I have no problem in learning how to use the latest agricultural technology	3.33
If I want, I can get another job other than being a farmer with my educational background and skills	2.54

Table 4 demonstrates a comparative analysis of adaptation among Sabahan highland farmers. Based on the mean scores for males (M = 3.78, SD = .73) and females [M = 3.59, SD = .69; t (200) = 1.829, p = 0.69], it was noted that there was no significant difference regarding climate change adaptation between gender.

Regarding the highland farmer's form of employment status, between full timers (M = 3.64, SD = .72) and part timers [M = 3.87, SD = .68; t (240) = 1.840, p = 0.67], there was no significant difference in terms of adaptation practices. Within the scope of Sabahan highland farmers, the resulted analysis has confirmed that there is an almost equal adaptation level between males and females, and between full time and the part time farmers.

Table 4: Differences on Adaptation between Selected Factors (Using Independent T-Test)

Factor	Mean	SD	t	p
Gender			1.829	0.69
Male	3.78	0.73		
Female	3.59	0.69		
Employment Status			1.840	.067
Full time farmers	3.64	0.72		
Part time farmers	3.87	0.68		

The ANOVA test confirmed that there is a significant difference between educational achievement groups in terms of their adaptation ability (5,200) = 10.750, p < 0.05). The findings concluded those with tertiary education have a better adaptation ability compared to other educational achievement groups. This research agrees that education is an important key for farmers to strengthen their adaptation practice and previous data had shown that highly educated farmers have greater access towards mechanisms such as technologies, landscape configurations and social capital (McDowell & Hess, 2012)

Table 5: Differences on Adaptation between Selected Factors (Using ANOVA)

Factor	Mean	SD	F	p
Education achievement			10.750	.0001
Never been to school	3.18	0.78		
Primary school	3.84	0.56		
Lower secondary school	3.73	0.57		
Upper secondary school	3.86	0.67		
Tertiary	4.09	0.51		

This research has concluded that there was a significant and negative relationship between adaptation capacity and age (r = -.289, p = .0001), a significant and positive relationship between adaptation capacity and income (r = .171, p = 0.16), and a significant and positive relationship between adaptation capacity and the number of household members (r = .240, p = .0001).

Regarding age, the findings have concluded that as these farmers get older, their adaptation ability gets weaker and these findings are in line with Masud et al. (2015) who claimed that younger farmers are capable to do more alternative and part time works compared to the older farmers. The same study has also proven that younger group has better knowledge possession and is more aware of the impacts of climate change compared to the older group. In terms of the significant relationship between income and adaptation ability, the study concluded that a better income could strengthen the farmers' financial capacity, which then assists them to have better reactive adaptation (before the disaster) and proactive adaptation (after the disaster) towards the impact of climate change. Furthermore, a significant and positive relationship between the number of household members and adaptation capacity shows that a big number of household members would mean more helping hands to seize responsibilities for their household adaptation ability toward the impacts of climate change.

Table 6: Relationship between Selected Factors and Adaptation Practices towards Climate Change

Factor	r	p
Age	-.289	.0001
Income	.171	0.16
Experience as farmers	-0.84	.238
Household members	.240	.001

Recommendations and Conclusion

This paper concludes that educational achievement, age, income and the number of household members all have an influence on Sabahan highland farmers' adaptation towards climate change. Few studies have confirmed that climate change will worsen in the future and it is expected to post formidable challenges for the highland farmers. This paper would like to stress on the issue of survival among local farmers, it is crucial for the concerned parties start taking this matter seriously, and there is a need to strategize a proper plan for highland farmer community. Knowledge is one of the important elements to strengthen highland farmers' adaptive strategy towards climate change (Masud et al., 2015) and to realize this; a specific training center for farmers to learn about adaptation towards climate change should be established. This

recommendation should be highly considered by highland farmer's associations or by concerned government agencies.

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