

## Awareness of Agricultural Extension Officers on the Climate Change and its impact on the Paddy Sector in Sri Lanka

W.A.D.P. Wanigasundera<sup>1</sup> and H.D.H. Fernando<sup>2</sup>

### Abstract

Climate change (CC) is reaching a catastrophic level during the 21<sup>st</sup> century and the farmers in developing countries are believed to be severely affected within the next few decades. Although the impact of CC on agriculture is slow, it has already started to affect the agriculture sector. For example by 2050, the paddy yield is expected to reduce by 20% in Sri Lanka. The agricultural scientists, especially those working on paddy, are making some progress in developing innovations to withstand the adverse effects of CC and the Agricultural Extension service has a responsibility to assist the farmers to adopt such technologies. The objectives of the study were; i) to assess the awareness of the Sri Lankan extension workers on the important issues related to CC and the innovations that could be adopted by farmers to mitigate the adverse impacts of CC on the paddy cultivation, ii) to find out the major factors affecting their awareness on CC and, iii) to make a preliminary assessment of the contribution of mass media to create awareness on CC by a content analysis. The data were collected by a questionnaire survey from 30 Agricultural Instructors (AIs) and Subject Matter Officers (SMOs) (out of a total population of 117) and 30 Agricultural Research and Production Assistants (ARPAs) who are considered as part-time village level extension workers in the Kurunegala district located in the North-Western Province which is predominantly an agricultural area having a high climatic diversity. All the AIs and SMOs had a Diploma or a Degree in Agriculture and only 10% of ARPAs had studied up to that level. Comparatively a high number of respondents (32%) were aware of the causes of climate change than its overall effects (23%) and specific effects on agriculture (22%). The AI and SMOs also had a significantly higher level of awareness on climate change compared to the ARPAs. The climate change awareness however, was not significantly related to age and experience of the respondents. But, the education level, the number of training programs attended and the time spent on reading newspapers showed a significant positive relationship with the CC awareness. The coverage of CC in two leading national newspapers during the last two years was studied by a content analysis. There were only 75 articles in 1730 English newspapers and 94 articles in 2380 Sinhala newspapers published during this period. It is recommended to conduct more training programs for the extension officers to impart knowledge and understanding on climate change. Mass media also should play a more significant role to enhance the awareness and to face the future challenges of climate change.

*Key words: Agricultural extension, awareness, climate change, paddy sector*

### Introduction

The climate today is already having significant negative impacts on the lives and livelihoods of poor people around the world. Indeed, droughts and floods are far from new phenomena, and farmers have

developed various ways of coping with them, and other weather extremes, over the centuries (Moorhead, 2009).

Small holder farmers in developing countries could mitigate the effects of

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<sup>1&2</sup>Faculty of Agriculture, University of Peradeniya, Sri Lanka

climate change through sustainable management but many of the small scale farmers are aware of the changing climate, its impacts and how mitigate them. Agricultural extension services have a grave responsibility to prepare the farmers for the challenges caused by climate change mainly through communication and the education. In order to prepare farmers, agriculture extension officers should have adequate knowledge about the adaptation strategies for climate change such as using short age and drought, high temperature, high humidity, pest and disease and salt resistant varieties, techniques of reuse of drainage water, soil test based fertilizer application

etc. Alternate wetting and drying, maintaining soil water content below saturation and maintaining at saturated conditions are some of the methods which could be adopted in rice cultivation. It had been studied that different irrigation water management systems at different growth stages on water use, water productivity and grain yield of rice grown in imperfectly drained rice soils (Zhang and Song, 1989). So it is a timely need to find out to what extent the agricultural extension officers have taken this problem to cognizance to help farmer to face the problems created by climate change.

### **Objectives**

This study aims to find out the level of awareness about climate change with regards to the paddy cultivation in Kurunegala district in Sri Lanka. The general objective was to assess the level of awareness of the agricultural extension officers in Kurunegala district about the climate change and its impact on paddy sector. The specific objectives were:

- 1) To find out the relationship between the awareness on climate change of agricultural extension workers with

their education level, access to media, duration of experience in the relevant field and the number of training programs participated.

- 2) To determine the accessibility to the various information sources by the extension officers on climate change.
- 3) To make a preliminary assessment of the contribution of media to create awareness on climate change.
- 4) To make suggestions to improve the awareness of extension officers on climate change.

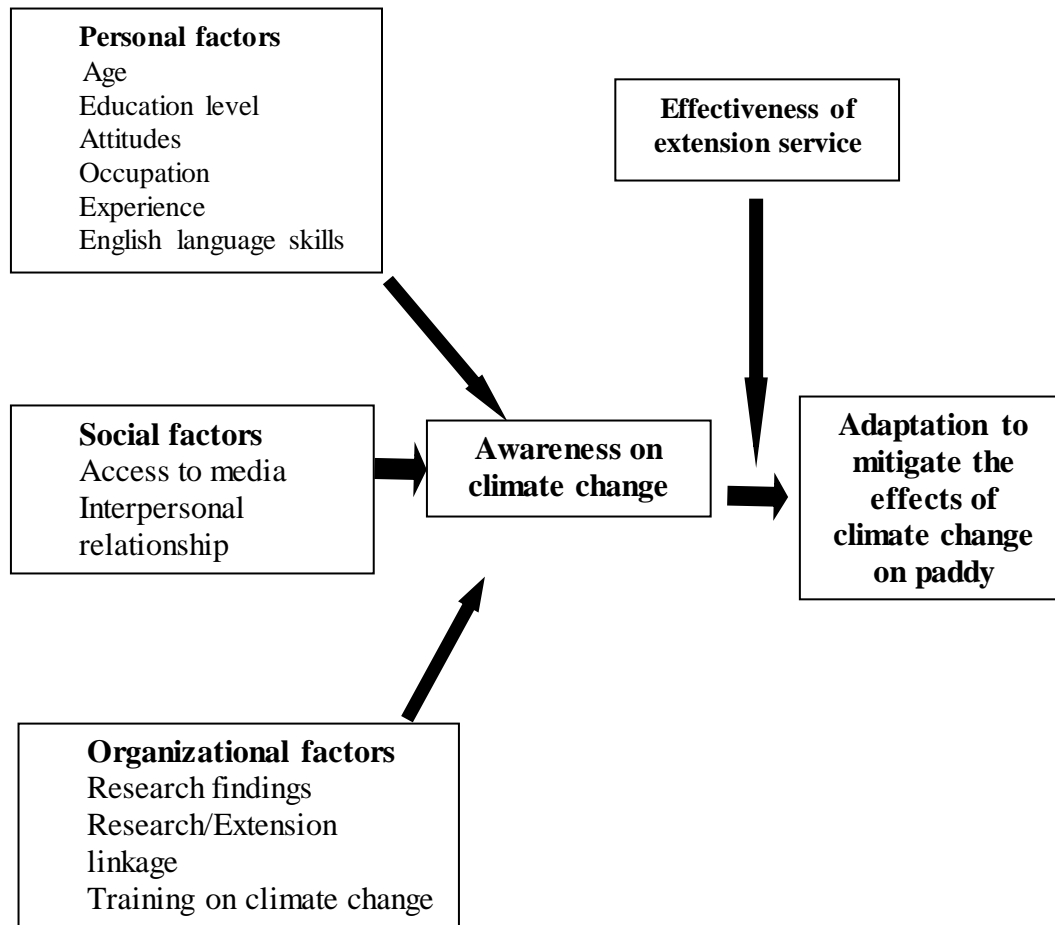


Figure 1: The conceptual framework of the study

## Methodology

### Selection of Study Area

Kurunegala district being one of the major paddy growing areas covering all the rainfall zones was selected for the study. The climatic condition is tropical with only slight variations in temperatures but heavily variable rainfall. The North-East monsoon brings rainfall to the entire district during October to December and the South-West

monsoon brings rain fall mostly to the southern part during March to June. The agricultural activities of the district closely follow the rainfall pattern. Average annual rainfall is vary from 900 mm to 2200 mm. Nearly 10% of the district belongs to the Wet zone, 20% to Dry zone, and the rest (70%) to the Intermediate zone.

Almost all irrigated lowlands are brought under rice cultivation during *Maha* season while, during *Yala* season rice is usually grown only in a part of these lowlands. A very large part of the paddy land is cultivated either rain fed or irrigated by small village tanks.

The level of awareness of climate change impact on agriculture of the extension officers is highly influenced by their individual characteristics, opportunities to participate in training programs and media access. The level of awareness was measured using a composite index. The awareness of Agricultural Research and Production Assistants (ARPAs), who are the village level extension service providers and the Agricultural Instructors and Subject Matter Officers (AIs & SMOs), who are the conventional agricultural extension workers operating at Agrarian Service centre level, were assessed using a questionnaire. The respondents were selected by stratified random sampling and numbers selected in each category is given in Table 1.

In addition to the questionnaire survey from AIs, SMOs and ARPAs, Key informant discussions were held with higher level extension officers in the Provincial

Department of Agriculture in Kurunegala and National Department of Agriculture in Peradeniya.

In order to find out the contribution from media in making the people aware on the climate change and its impact, key informant discussions were also held in two selected principal media institutes. An analyses of the content of two leading national newspapers (one published in Sinhala and one in English language) published during the last two years (May 2008 to April 2010) was also conducted.

Dependent variable is the awareness of climate change impact on agriculture. The level of awareness of climate change impact by agricultural extension officers were measured by using a composite index. Questionnaires were developed to collect the necessary information. Items included in the questionnaires were based on the objectives of the study. In constructing the questionnaire, items, both open ended and closed ended questions and statements were used. Attention was also given to sequencing the sections and ordering items within each section.

Table 1 The survey study population and the sample of respondents

Criteria	Type of Extension worker	
	AIs and SMOs	ARPAs
1. Total Population	117	1000
2. Extension Centers in the district	7 Zonal Agricultural Offices	55 Agrarian Service Centers
3. No. of centers selected for survey	All 7 Zonal Agricultural Offices	10 Agrarian Service Centers
4. Sample size	30	30

Questionnaires were pre-tested with three agricultural extension workers including one Subject Matter Officer, Agricultural Instructor and an Agriculture Research and Production Assistant from the study area.

The data were analyzed by using the SPSS (Statistical Package of Social Sciences). The general situation of the sample extension officers was described using the simple statistics such as frequencies and percentages. Comparison between the Agricultural Research and Production Assistants with Agricultural Instructors and Subject Matter Officers was done by using the t-test to find whether there is a significant difference of the awareness level of the climate change impact to the paddy sector. In addition to the t-test rank correlation analysis was also used to test the relationships.

Statements of knowledge components of climate change were categorized according to their importance by three climate change

subject experts. The statements were categorized into four namely not relevant, less important, moderately important and highly important. According to those categories, different weightage were given to those statements. According to the marks of the respondents, the level of awareness was calculated.

### **Limitations of the Study**

The mitigation of the effects of climate change needs the direct behavior change by the farmers. In this study however, the level of awareness of the farmers was not assessed due to time and resource limitations. To find out the contribution of the media to create awareness of people on climate change comprehensive content analyses is needed. Due to the time limitation, only the key informant discussions with two media institutions were conducted.

## **Results and Discussion**

### **Demographic characteristics of the respondents**

There were 60 extension officers surveyed, of whom 30 were Agricultural Instructors and Subject Matter Officers. The rest were ARPAs. Ninety two percent of the respondents were males. The highest proportions of females (13.3%) were found among ARPAs.

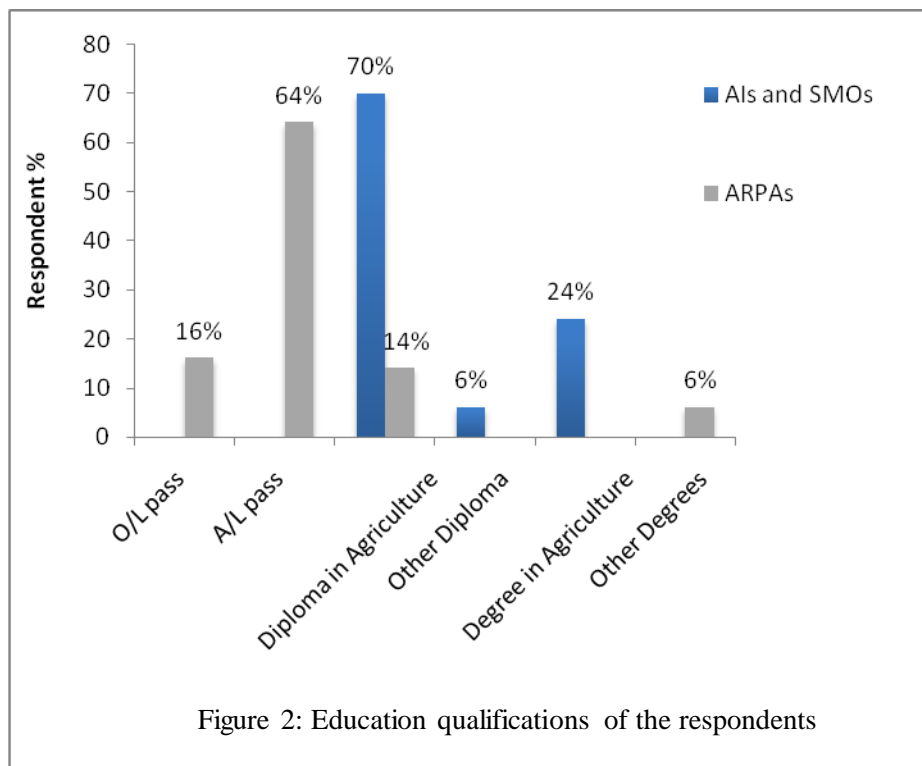
### **Age and Experience of respondents**

The age level of the respondents varied from 27 to 59 years. Majority of them were 30 to 50 years of age. The mean age of the respondents was 41.5 years (Figure 4.1). The majority of the officers were in older age categories. The reason might be that they have not been recruited for a period of time. The experience of the respondents had varied from 1 to 37 years. The mean experience was 12.75 years. There was a

different of the experience of the respondents (Figure 2). Only 26 % of the ARPAs had less than 10 years of experience compared to 54 % of the AIs.

Only 20% of the ARPAs had studied up beyond GCE (Advanced level), but all the AIs and SMOs had studied beyond Advanced level. However, a minority (6%) from the ARPA group had had higher education in social sciences.

There are opportunities to learn about climate change using the modern technology such as internet which requires English language skills. The English language skills of the ARPAs varied from 'good' (10%), 'average' (80%) and 'poor' (10%) while, that of AIs and SMOs' it was better and varied from 'very good' (10%), 'good' (50%) and 'average' (40%).



There had been some training programs conducted by Natural Resource Management Center, Department of Agriculture and some NGOs, in which the climate change and its impact discussed. The mean number of training programs participated by the respondents during last two years was seven and the mean number of training programs discussed about climate change was only one thus showing the inadequacy of the attention paid to this important aspect.

There has been a significant reduction of annual average rainfall by 7% during the time period of 1931-1960 to 1961-1990 by the North-East monsoon, while the South-West monsoon has no significant change (Department of Meteorology, 2010). According to the respondents, 65% responded that no rain available when

farmers expect and rain when not expected. So they have observed a significant change of the distribution of rainfall pattern and rain is not coming when it is expected. It has been noticed by 38% that the amount of water received to the catchment has decreased when compared to the situation 5 to 10 ago.

Majority (53%) of the respondents said that the area had experienced drought conditions extending for one to six months within the last five years. This has severely affected to the paddy cultivation of the area resulting in many neglected paddy lands that cannot be cultivated because of the water scarcity. Majority (82%) of the respondents also said that recently there have been increasing pest attacks when compared with five years before. The main pests they found were Brown Plant Hopper (BPH) and Rice Leaf

Folder. Population fluctuation study has revealed that BPH population was high with heavy rainfall, high temperature and high humidity. The BPH population is reduced with the low rainfall and low humidity. The erratic weather is responsible for such fluctuation of BPH population (Win *et al*, 2011).

According to the Lichfouse (2009), with increasing the warm weather conditions, relative humidity and temperature, there is high tendency to increase disease problems, especially fungal attacks. Majority (77%) of the respondents said that the rice cultivation of the area was severely affected by diseases. Rice Blast and Sheath Blight are the commonest diseases as mentioned by 53% and 40% of them respectively. Seventy percent of them responded that there has been an increasing trend of the weed problems too.

#### **Awareness level of climate change of the respondents**

Awareness on climate change was measured by statements that describe the causes,

overall effects and impact to the agriculture. Composite index was developed using the statements which were ranked according to their importance by an expert panel. Different weightages were given to the statements according to their relative importance. The awareness was categorized in to three levels, low, medium and high by using half standard deviation method (Table 2).

The composite index ranged from 0 to 47 for the causes of climatic change. The minimum and the maximum scores obtained by the respondents were 11 and 47. As shown in Table 2 the majority of ARPAs had a low level of awareness on causes and effects of climate change and medium awareness on the impact on agriculture. The majority of the AIs & SMOs had a high level of awareness on causes and impact on agriculture and medium awareness on its effects.

Table 2 Percentage distribution of the awareness level of the extension officers

Criteria	AIs and SMOs %			ARPAs %		
	Low	Medium	High	Low	Medium	High
1. Causes of climate change	20.0	26.7	53.3	50.0	40.0	10.0
2. Effects of climate change	20.0	46.7	33.3	46.7	40.0	13.3
3. Climate change impact on agriculture	10.0	30.0	60	33.3	50.0	16.7

#### **Overall awareness level of the respondents**

The total marks of the three sub categories were combined to estimate the overall awareness of the respondents. The distribution of the total score of the respondents is shown the Figure 2. The

overall awareness score was significantly higher among the AIs and SMOs (mean score-100.37) than the ARPAs (mean score-87) ( $t = 4.28$ ,  $df = 56.36$ ,  $Sig. = 0.01$ ).

The ARPAs, there should have a satisfactory level of awareness on climate

change because they closely work and interact very frequently with farmers.

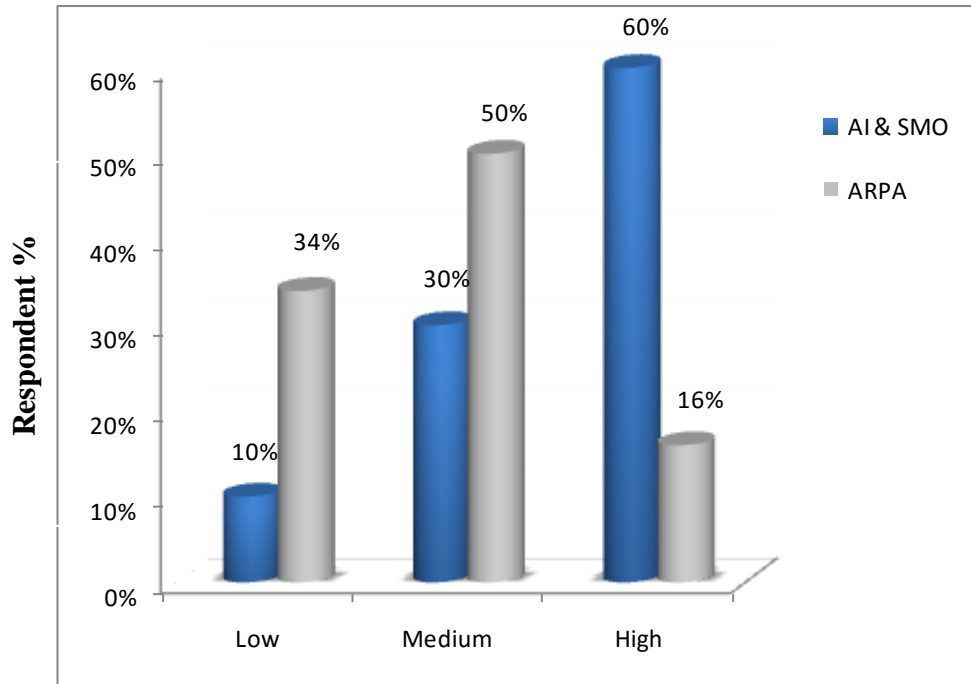


Figure 3: Percentage distribution of respondents according to the level of awareness

#### **Respondents' ability to propose mitigatory measures to the climate change effects on paddy**

##### **Use of improved varieties**

There are some soil and water management practices that can be used to protect the paddy cultivation from the negative impact of climate change. According to Punyawardena (2002), using improved varieties is one of major solution. This can be achieved through developing varieties with short age, drought resistance, pest and disease resistance, high temperature resistance and salt resistance varieties. Sixty two per cent of the respondents suggested the improved varieties as a solution for changing climate.

#### **Development of efficient irrigation systems**

Rehabilitation of irrigation canal network and minor tanks to operate at their designed capacity have been suggested as adaptation strategies for climate change by Fernando and Chandrapala (1995). The respondents (38%) also suggested this as an adaptation strategy as large amount of water is wasted through leakages from the canals. This is very useful for dry zone of the country where water scarcity is becoming a major problem for cultivations.

##### **Organic matter usage**

As a soil and moisture conservation practice organic matter addition to the soil is appropriate, as it helps to retain moisture and withstand water stress condition. This was suggested as an adaptation strategy for



increasing temperature and water scarcity by only 28% of the respondents.

### **Rainwater harvesting**

Rainwater harvesting (domestic and on-farm) also has been introduced as a strategy for changing climate, dry zone of the country can take advantage from this. However, only 23% of respondents suggested this strategy.

### **Changing cultivation pattern**

Only 28% of respondents suggested that it is possible to change the cultivation pattern such as saturated soil culture and alternative wetting and drying for rice as a strategy for climate change. Many of them suggested to plant rice in fully aerobic conditions (*Nawa kakulan*).

### **Improve the drainage systems**

Only 5% of the respondents suggested improving drainage system as a strategy. Fernando and Chandrapala (1995) have suggested large scale drainage improvement projects as a strategy for adaptation to climate change, especially in the Low Country Wet Zone.

### **Enhance farmers' awareness on climate change and its impacts**

According to the FAO (2009), very few farmers were aware about the climate change in developing countries. Thailand also has begun work on an action plan for global warming mitigation and providing information to raise awareness about climate change. Only 22% of respondents suggested that it is essential to enhance the farmers' awareness on climate change and how to adapt to the situations where climate is changing rapidly. It could be seen that not only the awareness of the extension officers about the mitigatory measures is particularly low but they also have very poor attitude about this important issue and

hence a special attention need to be paid to correct this situation.

### **Relationship between the awareness level and individual characteristics**

As shown in Table 3 the relationship between the age and the awareness were not significant. The awareness of climate change is not related to farming experience and could be due to the fact that this phenomenon is a recent one. Education level of the respondents showed a significant positive relationship with the awareness level. AIs and SMOs who had a higher education in agricultural sciences than ARPAs had a higher awareness. Therefore, it could be suggested that basic science knowledge is useful to understand new information on current environment problems and understanding the climate change and its impact on agriculture.

Table 3 Associations between variables and the level of awareness on climate change

Variable	Spearman 'r'	Significance
Age	-0.187	0.154
Experience	-0.155	0.238
Education	0.350	0.006
English language skills	0.359	0.005
Attending training programs discussed climate change	0.351	0.006

There was a highly positive relationship between English language skills and the awareness level. Having English language

skills are very important to access the modern technology through the Internet and other published material. It is English that open the door to receive the new information about science and technology. Therefore, having English language skills effects to get to know about climate change. The training programs that discussed about climate change and its impact showed a positive relationship with the awareness. Training programs have played a significant role in enhancing the awareness level of the extension officers. The respondents also mentioned that most of the training programs that discussed about climate change were organized by the NGOs.

#### **The level of access to information sources and its relationships with the awareness level on climate change**

To determine how extension officers receive information on climate change from various sources, they were supplied with a list of information sources and asked to indicate the total number of minutes spent to get the information from each of those sources per day. The highest amount of time has been spent by the respondent to watch television and the least amount for the internet use. About 23% of the respondents have heard about climate change from their colleagues and 10% of respondents from their superiors.

Radio is a mass communication medium which can reach a large number of people at

any given time involving the least expense. Nearly half (48.3%) of the respondents had heard about climate change from the radio. Although 85% of the respondents said they have heard about climate change from the television, there was no relationship with the time spent on television and the awareness score. As in the case of the radio, television also may have the same problem. A majority (67%) of respondents said that they have got some information on climate change from newspapers. There were very few respondents (15 %) using internet and no one was found got information about climate change from the internet.

Agricultural publications accessed by the respondents have not given any information on climate change and they have been discussed only the technical part of cultivations.

#### **Contribution of mass media to provide the information on climate change – A content Analysis**

According to the findings of key informant discussions during the period of May of 2008 to May of 2010, the selected newspaper agencies had published seventy five articles in 1730 of English Newspapers and Ninety four articles in 2380 Sinhala Newspapers. According to the key informant discussions had with a Television Network, during the last two years, only two weekly programs had little information on climate change.

### **Conclusion and Recommendation**

#### **Conclusions**

AIs and SMOs had a comparatively higher education than the ARPAs. The awareness on causes of climate change of the respondents was comparatively higher than its effects and the impacts of climate change on agriculture. Higher proportion of AIs and

SMOs had higher awareness than the ARPAs on climate change and its impact. Education level, English language skills and the number of training programs attended showed a positive significant relationship with the awareness. However, very few

training programs had been organized related to climatic change.

Newspapers have contributed to give information on the causes of climate change, its effects and the impact on agriculture. However, the contribution of other media is inadequate.

### Recommendations

More training programs to discuss about climate change and its impact to make aware thoroughly the agricultural extension officers. Those training programs should be prepared according to the education level and the current needs of the extension services.

Mass media should play a more significant role on making aware the current environment issues related to climate

change. There should be more focus on the required mitigatory measures in relation to agriculture.

During this study, only the contribution from a selected newspaper agency and a television channel was considered. So it is recommended to find out the contribution of other all private and government media institutes and make appropriate suggestions. This study only focuses on the awareness of extension officers. The impact of climate change on agriculture has already started. The farmers are the people who suffer from most from the negative impact of climate change. Therefore, it is imperative to take immediate steps improve the awareness on climate change of the farmers as well.

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