ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 06, Issue, 06, pp. 8061-8066, June, 2016

International Journal of
DEVELOPMENT RESEARCH

Full Length Review Article

THE THIRST OF CENTRAL HIGHLAND IN VIETNAM

[1,*]Kwong Fai Andrew Lo and [2]Hoan-My Nguyen

[1]Graduate Institute of Earth Science, College of Science, Chinese Culture University, Taipei 11114, Taiwan
[2]Graduate Institute of Architecture and Urban Design, College of Environmental Planning, Chinese Culture University, Taipei 11114, Taiwan

ARTICLE INFO

Article History:

Received 26th March, 2016
Received in revised form
14th April, 2016
Accepted 19th May, 2016
Published online 30th June, 2016

Key Words:

Coffee Plantation,
Deforestation,
Water-Saving Irrigation Schemes,
Water Policy,
Water Storage Facilities.

ABSTRACT

Central Highland is one of the driest regions in Vietnam. Extended dry spells linked to El Nino phenomenon have raised serious concerns and often affects the local economy and livelihood of local residents. The main objective of this study is to assess causes of this worsening drought problem and to suggest possible solutions for alleviating this problem. In recent years, the exploitation of excess water sources for growing high cash crops such as coffee has caused a serious imbalance between surface water and groundwater. Average temperature will increase in the future, but the rainfall total will remain the same or with no significant increase. This prolonged drought has been blamed on the provinces' rapidly shrinking forest coverage. Therefore, rational water resources use is necessary to avoid depletion of fresh water supply for daily life. Appropriate groundwater extraction is highly recommended to prevent groundwater supply decline. Widespread water storage facilities should be promoted to harvest rainwater during rainy seasons to satisfy non-potable water requirement during dry seasons. Great quantity of rainwater/floodwater storage may mitigate prolonged drought problems frequently occur in the Central Highland region.

INTRODUCTION

Central Highland is located in mid-southern part of Vietnam. It comprises of 5 provinces namely: Dak Lak, Dak Nong, Gia Lai, Kon Tum and Lam Dong (Figure 1). The population as well as land size area statistics is listed in Table 1. Dak Lak, Gia Lai and Lam Dong Provinces all have population exceeding 1 million. Dak Nong is a small (6,517 km^2) province, but with relatively high population density (62.5/km^2). Kon Tum, in the northern part, is the province with the least population density (39.5/km^2), whereas the highest population density is in Dak Lak Province (132.2/km^2) in the central part. Climate of this region belongs to the tropical Savanna and is divided into two seasons: the rainy season (from May to end of October), and the dry season (from November to April). This region has an average altitude of 500 – 600 m, with basaltic soil suitable for planting coffee, cacao, pepper and white mulberry. Cashew and rubber are also commonly planted in this area.

Corresponding author: Kwong Fai Andrew Lo
Graduate Institute of Earth Science, College of Science, Chinese Culture University, Taipei 11114, Taiwan.

Coffee is the most important agricultural product of Central Highland, with production center in Dak Lak Province. Central Highland is also the first largest coffee planting area in Vietnam. There are several major coffee factories in the capital City of Buon Ma Thuot, including one owned by the famous coffee producer Trung Ngyuen. Besides, Central Highland is also the second largest rubber planting area, just after the largest Southeastern area of Vietnam. Central Highland is one of the driest regions in Vietnam (Figure 2). In recent years, extended dry spells linked to El Nino phenomenon have raised serious concerns from all sectors living in this area. The main objective of this study is to assess causes of this worsening drought problem and to suggest possible solutions for alleviating this problem.

THE THIRT OF CENTRAL HIGHLAND

The Situation

Vietnam has experienced many scorching weather spells linked to El Nino in the central, Central Highland and southern provinces.

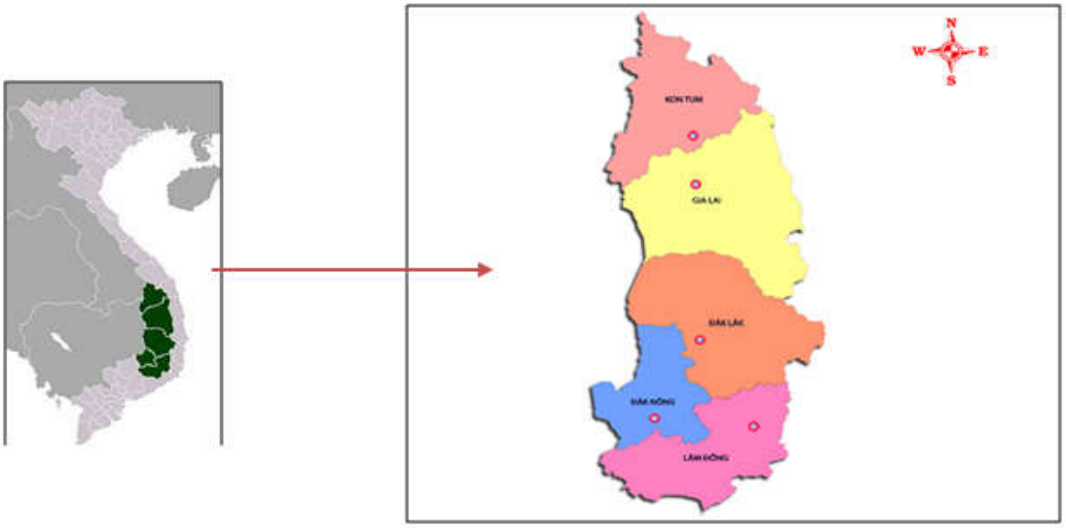


Figure 1. Map of Central Highland in Vietnam

Temperatures in the affected areas have been 0.5 to 1.5°C higher than the average. These areas are subject to fewer storms, but with higher intensity than usual. Drought often occurs earlier than in previous years (ISPONRE, 2009). Scientists have confirmed that the 2015-16 El Nino period is looking severe and also the longest over the past 60 years (Nguyen, 2016). During the worst 2015-16 El Nino phenomenon, the central provinces have only occasional rain. Many reservoirs stored less than 20% of their capacity. If El Nino continues, droughts would become even more serious. Central Highland residents often do not have enough water for daily life when the dry season comes. There are over 30% population in drinking water shortage during March and April in 2015 (NCHMF, 2015a). Not only drinking water shortage, thousands of hectares of plants is likely to dry out because of drought. Water in dams, lakes and rivers are dwindling. In Buon Ma Thuot City, Dak Lak Province the daily water demand is about 60,000m^3. In 2015, though running at full capacity, the waterworks of the province can only provide 40,000m^3/day (MARD, 2015). Rainfall during this dry period has been lower than average, at just 60-80% of the usual volume and scattered unevenly. Among the 770 reservoirs across the province, only 250 have managed to store 60-80% of their capacity.

The Damages

According to recent statistics (MARD, 2015), Dak Lak Province in 2015 has 44,103 ha of arid crops, including 34,315 ha coffee, 8,535 ha rice, 253 ha maize, and 600 ha vegetable crops. Extended dry spells will take a heavy toll on residents' production and daily life (Figure 3). When most reservoirs water level drop to less than 10%, a dire shortage of water for daily consumption and massive damage in terms of cattle and crops will occur. At its worst, the drought deprived nearly 25,158 residents of water for everyday activities, left 2,515 cattle dead from thirst and 2,079 ha of crops damaged. The area of crops lost most due to water shortage are mainly rice and maize. The 2014-15 winter-spring and summer-fall crops in Dak Lak Province production loss reaches as high as VND 2 trillion (US$ 89.6 million) and VND 171 billion (US$ 7.7 million), respectively (Nguyen, 2016). In Gia Lai Province, the agricultural areas faced with water shortage risk include Dak Po, Krong Pa, Kong Cho Ro, and Ayun Pa, in which large areas of crops are lost (Nguyen, 2016). In Dak Nong, over 1,000 ha of coffee plantation do not have enough water to survive and about 18,000 ha suffer from water shortage.

Table 1. Population and land area statistics at the Central Highland Provinces

Province	Capital City	Population	Land Area (km^2)
Dak Lak	Buon Ma Thuot	1,737,600	13,139.2
Dak Nong	Gia Nghia	407,300	6,516.9
Gia Lai	Pleiku	1,161,700	15,536.9
Kon Tum	Kon Tum	383,100	9,690.5
Lam Dong	Da Lat	1,179,200	9,777.1

THE CAUSES

Exhaustion of Groundwater

Central Highland is the largest basalt soil area in Vietnam, and can absorb rainwater very easily. But, in recent years, the exploitation of excess water sources for growing high cash crops has caused a serious imbalance between surface water and groundwater. Over the years, coffee plantation in the Central Highland has been expanding continuously and caused a massively high pressure on water resource demand. Coffee plantations are often far from water sources. Central Highland has about 500,000 ha of coffee land (about 54% of the total land area) (Table 2).

Table 2. Area of coffee plantation and total area percentage at the Central Highland Provinces

Province	Coffee Plantation Area (km^2)	Percent of Total Land Area (%)
Dak Lak	2,001.6	15.2
Dak Nong	1,163.5	17.9
Gia Lai	776.3	5.0
Kon Tum	121.6	1.3
Lam Dong	1,457.3	14.9

Of which more than 50% irrigation water used for coffee plants are taken from the wells and dug-wells during the dry seasons (Figure 4). In particular, Dak Lak Province has over 200,000 ha of coffee land, and uses 56% irrigation water from wells. Gia Lai Province has over 77,000 ha coffee land and uses 20% irrigation water from lakes and ponds. The remaining 80% comes from rainfall and groundwater. In just six years, the number of wells in Pleiku City (Gia Lai Province) has rapidly increased. In 2005, there are only 47 wells, but there are more than 200 wells in 2011. Only about 70 wells have been licensed. The others are "illegal" wells. This has affected groundwater level and caused severe groundwater pollution (MONRE, 2012).

Low Rainfall and Prolonged Drought

In Vietnam, the drought risk is measured by either annual rain falling less than 80% of average annual rainfall, or less than 1.0 mm rain within 14-days period (Shaw and Nguyen, 2015). In Central highland, the dry season often occurs from November to next year May. In 2012, the rainy season ends in October. In 2013, the rainy season ends even earlier than in 2012, indicating a prolonged dry season over the years. Rainfall in Central Highland reaches only 30-40% of the long-term annual rainfall in 2014. The total rainfall is about 1,500-2,000 mm. In the first 3 months of 2015, Central Highland has very little rain. Some areas have no rain at all.

Figure 2. Drought in the Central Highland (Nguyen, 2016)

Figure 3. Crops are dead because of lacking water (Nguyen, 2016)

Figure 4. Coffee growers in the Central Highland Provinces dig wells in a desperate attempt to save their crops (Nguyen, 2016)

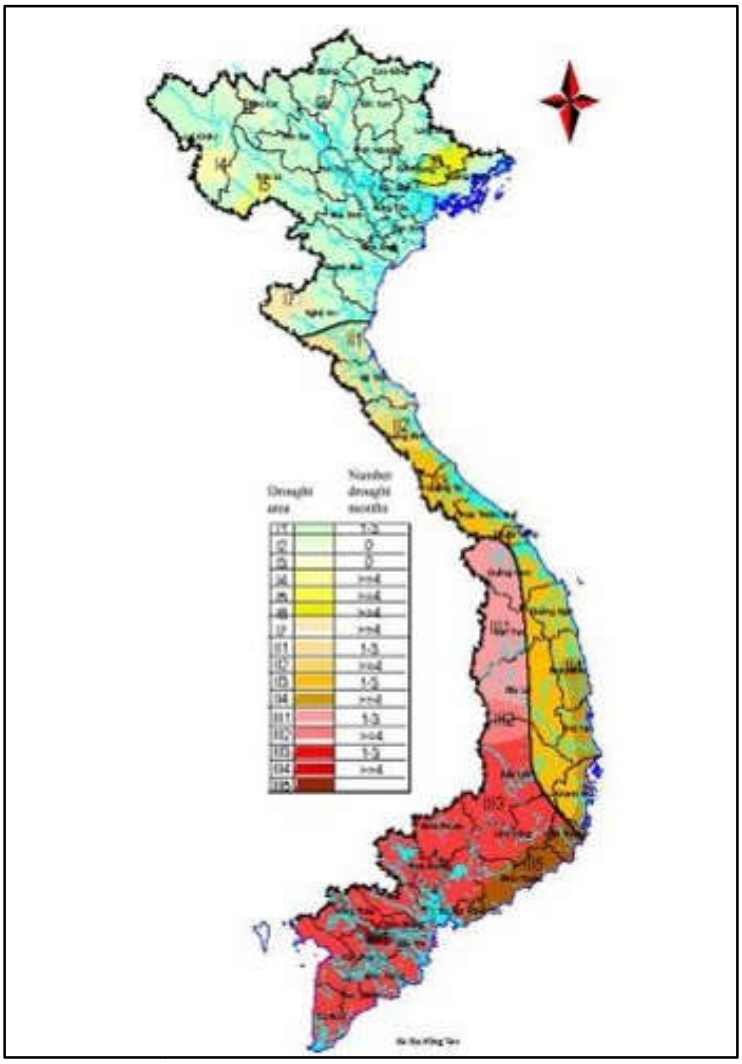
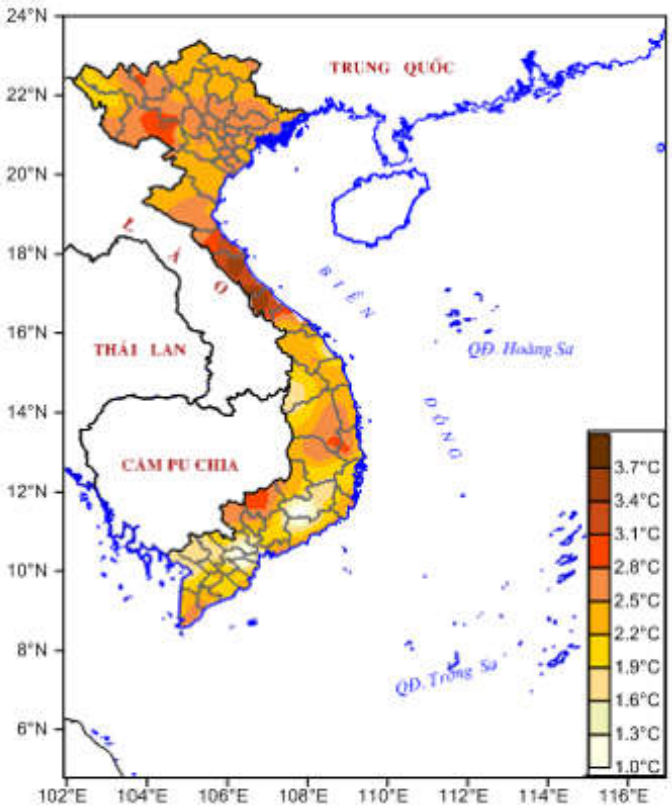
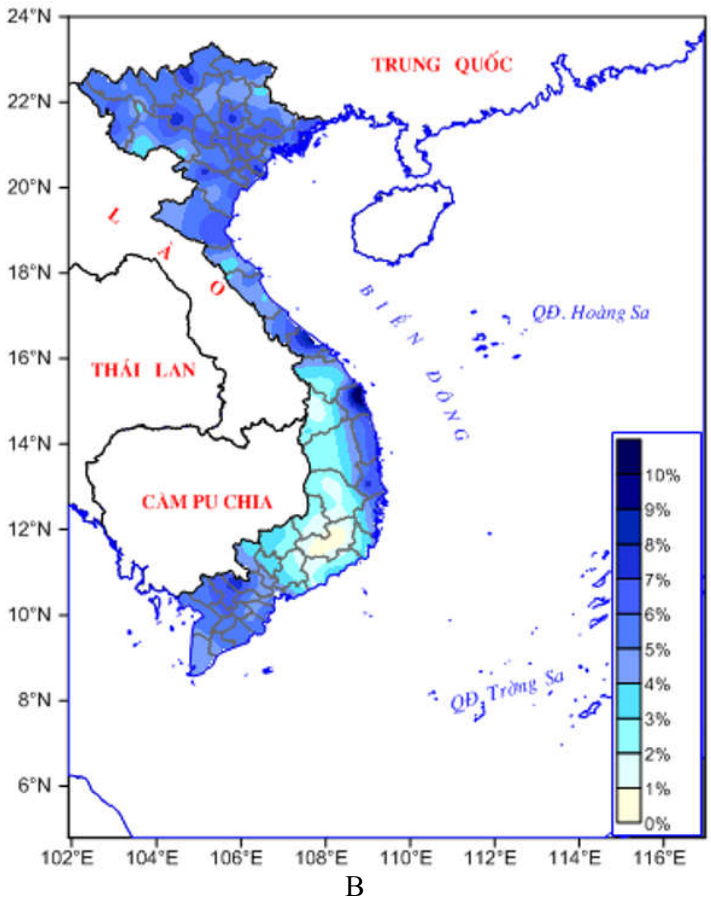


Figure 5. Spatial distribution of drought in Vietnam (1960-2005) (Nguyen, 2010)



A



B

Figure 6. 2011 average temperature (A) and rainfall (B) increase in Vietnam (NCHMF, 2015b)

On the whole, the region lacks 40-100% water compared to normal years. Based on the long-term (1960-2005) records (Figure 5), Central Highland is listed as one of the areas with frequent prolonged droughts in Vietnam (Nguyen, 2010). Water shortage often affects the local economy and livelihood of local residents.

High Temperature

Reported by the Center for Hydrometeorlogy of Dak Lak Province, the average temperature of winter-spring 2014-15 is 0.5 to 1^{o}C higher than in previous years (NCHMF, 2015b). Among them, the hottest period occurs in April with the highest temperature reaching 38^{o}C, and precipitation lower than previous years. According to the trend of temperature increase in Central Highland (Figure 6), the average temperature will increase in the future, but the rainfall total will remain the same or with no significant increase. This is the basic reason why there are many prolonged droughts occurring in recent years in Central Highland.

Deforestation

In the Central Highland Province of Dak Lak, drought has been blamed on the province's rapidly shrinking forest coverage. A recent inspection reveals that the forest coverage amounts to a mere 39% of the previous years' total. In 2013, the Department of Forestry, Ministry of Agriculture and Rural Development reports that between 2007 and 2013, five provinces of Central highland (Gia Lai, Kon Tum, Dak Lak, Dak Nong, Lam Dong) have lost more than 129,000 ha of forests, including 107,400 ha natural forests and 22,200 ha plantation forests (MARD, 2015). The region loses, on the average, 25,700 ha of forest each year. The current forest cover is only about 51.3%. Several rare wood and forest products have now become extinct. Reduced forest coverage may influence groundwater retention in the region. If forested areas in the province, which serve as the Central Highland region's "lung" fail to be restored, the effects of drought may become catastrophic.

REMEDIAL MEASURES

Water Storage Facilities

There have yet to be feasible drought-combating measures for long-term cash crops, as coffee and pepper farms are all located in areas with no reservoirs, while groundwater levels have dropped constantly. Now that rainfall has declined, storms are often welcomed as additional source of water despite their devastating power. Therefore, governments need to maintain the old reservoirs and construct more new reservoirs to store water for the dry season. Every household and business needs to store and save water in rainy season to prepare for dry season. Frugal residential water use should be encouraged during dry periods. Rainwater and surface water should be used more for agriculture instead of dug-wells.

However, water storage for hydroelectric purposes should be used sparingly in order to save resource for drought-hit areas.

Agriculture Water Use

To effectively battle droughts, priority should be placed on water use for daily human and cattle consumption. Governments need to classify water needs for plantation and supply water according to the crop priority. Farmers should be encouraged to save and conserve water. Water-saving irrigation techniques such as drip and sprinkle methods may reduce irrigation water requirements and watering turns. However, it would take an initial investment of VND 70 million (US$ 3,135) per ha to adopt a trickle irrigation watering system, which farmers cannot afford.

Water Policy

Unlawful dug-wells should be discouraged along with unrestricted groundwater pumping. This ensures adequate supply of water requirement even during prolonged droughts. Policies to protect deforestation also are urgently needed to enhance forest cover and groundwater retention. This enables well distributed low flow water and better water supply condition even during dry season.

Conclusion

Water shortage of the Central Highland in Vietnam is a typical consequence of wasteful water resources. Our planet has only 3% fresh water and 97% salty water. Therefore, rational water resources use is necessary to avoid depletion of fresh water supply for daily life. Appropriate groundwater extraction is highly recommended to prevent groundwater supply decline. Fresh water should be limited to potable purposes. Widespread water storage facilities should be promoted to harvest rainwater during rainy seasons to satisfy non-potable water requirement during dry seasons. Great quantity of rainwater/floodwater storage may mitigate prolonged drought problems frequently occur in the Central Highland region.

REFERENCES

ISPONRE, Vietnam Institute of Strategy and Policy on Natural Resources and Environment 2009. Vietnam Assessment Report on Climate Change. Van Hoa Thong Tin Publishing House, Hanoi, Vietnam, ISBN: 0-893507-779124, 110pp.

Mard, Vietnam Ministry of Agriculture and Rural Development 2015. Statistics Report. Centre for Informatics and Statistics, 350pp.

MONRE, Vietnam Ministry of Natural Resources and Environment 2012. Climate changes and sea level rise scenarios for Vietnam. Ministry of Natural Resources and Environment, Hanoi, Vietnam 68pp.

NCHMF, National Centre for Hydro-Meteorological Forecasting 2015a. Provinces launch battles against drought. Retrieved from www.nchmf.gov.vn/web/en-US/71/103/28631, 4/11/2016.

NCHMF, National Centre for Hydro-Meteorological Forecasting 2015b. Long droughts hits VN crops. Retrieved from www.nchmf.gov.vn/web/en-US/71/103/28631, 5/9/2016.

Nguyen, L. 2016. Viet Nam's farmers suffer as El Niño contributes to widespread drought. International Federation of Red Cross, Vietnam, retrieved from www.ifrc.org/en/news-and-media/news-stories/asia-pacific/Vietnam/, 5/10/2016.

Nguyen, N. 2010. Climate change and risk management: Study on the local adaption in the South Central Vietnam. PhD Thesis at Kyoto University, Japan.

Shaw, R. and H. Nguyen 2011. Droughts in Asian Monsoon Region. Emerald Group Publishing Ltd., ISBN:978-0-85724-863-3, 186pp.

****