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Research Paper

Reduce Impact of climate change in Flood Area of Quang Binh Province by Crop Rotation

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ABSTRACT:
In recent years in Vietnam, prolonged heavy rains have caused floods and landslides in the central provinces, causing heavy damage to both people and material. Under the influence of climate change, landslides and floods occur with a high frequency, washing away hundreds of hectares of agricultural land, encroaching on houses, directly threatening the livelihoods and lives of thousands of people. In the mountainous areas of our country flash floods and erosion often "double waves" increase the level of danger. Last October in Quang Binh, flash floods occurred unexpectedly on small mountain river basins, fast currents, accompanied by mud and rocks, rapid ups and downs, its destructive power was too great. statistics in this article. In the forest planning in the period 2020-2030 of Quang Binh province, crop rotation by planting bamboo to replace industrial trees will be located in the map of forest three kind.

KEYWORDS: *Acacia, Bamboo, Crop rotation, Climate change, Forest Planning*

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I. INTRODUCTION

Quang Binh is a province in North Central Vietnam, the narrowest place in the East - West direction of our country. With sloping terrain, strongly divided by a network of rivers and streams, this place is one of the localities in the Central region that is heavily affected by natural disasters of Vietnam, especially natural disasters of hydrometeorological origin. In fact, the situation of erosion and landslides caused by floods and storms that occurred from October 16 to 21, 2020 exceeded the historical flood in 1979 and caused a loss of 3,500 billion VND in Quang Binh province. Never before has a natural disaster struck with a rainfall of over 1,000mm in many places and for such a long time, flooding a large area, making the lives of people who have been heavily affected by the COVID-19 pandemic even more difficult. difficult, precarious. Once again, the problem of preventing erosion, landslides caused by storms and floods and more broadly responding to climate change is raised [1].

Flash flood is a flood that occurs suddenly in small mountain river basins with fast currents, often accompanied by mud and rocks, floods that rise and fall quickly, with great destructive power. Flash floods often cause great damage to people and property. Because of the great destructive power appearing on the basin with high slope, steep slope and through the river and stream system, the water concentration is very fast. Floods are short-lived (usually at night and in the morning), have great speed, sweep everything in their path. The formation of flash floods is closely related to rainfall intensity, climatic conditions, topographical features, human activities as well as flood drainage conditions of the area [10].

The recent flood in Quang Binh Province shows that acacia forest is economically viable but not long-term. Acacia trees do not hold the soil, but on the contrary, hilly acacia plantations are at greater risk of landslides because acacia roots are shallow. When the tree is cut down, the roots rot and create pipes to bring water from the surface to the ground. very prone to landslides. Seeing with the naked eye, there are green mountains and hills with thousands of acacia leaves. But in fact the vegetation under the acacia tree is almost gone. Rainwater penetrates directly into the ground and does not have time to infiltrate. Acacia trees also increase the weight of the hillsides, becoming invisible to the mountain slopes, increasing the risk of landslides.

It can be said that acacia in particular and other industrial trees in general do not bring benefits in protecting the hillside. Recent storm also showed that cinnamon, a kind of industrial tree is not strong enough to withstand wind storms. Acacia trees have a very outstanding feature that is fast growth, easy to adapt to many

types of soil. especially the barren hilly land, sandy soil. This plant is grown massively for only one reason: good adaptation and fast harvest, more yield than other crops on the same terrain. The policy of growing acacia is not wrong, but people mistakenly believe that acacia hill is a forest, but acacia trees are the same as rubber trees, in fact it is an industrial tree, optimal in terms of economic efficiency, but does not contribute much to the soil environment. Acacia has a shallow root system, the wood substance is also very easy to decompose, because the tree grows too quickly and is developed in a very short time, so the effect of keeping the soil is not as much as that of natural forests and large trees. The danger of this plant is that it absorbs a lot of water, the roots are dense, so where the acacia grows, the soil is very dry, the air is hot. Where acacia is grown, other plants cannot grow. Thus, it can be said that about the value of contribution to the environment, acacia has no or very little, acacia leaves also belong to the group of slow decomposition. Currently, when people have finished harvesting acacia, they have a habit of burning them, so the creatures are also destroyed. Therefore, acacia should only be considered as an economic tree, not as a protective or anti-erosion tree. Areas near river basins in landslide-prone areas should not grow this species, but must change the crop rotation [11].

As for bamboo, scientists have proven that this plant has the ability to resist coastal erosion, even more effective than concrete fences in muddy areas. In fact, Thailand has successfully applied bamboo poles on the coast to prevent coastal erosion of Samut Sakhon. In addition, bamboo is useful for restoring degraded lands for a number of reasons: Bamboo thrives on steep slopes unsuitable for other crops; Bamboo is an effective windbreak, and its sturdy rhizomes regulate water flow and prevent erosion. In 2018, INbar published a report on the benefits of bamboo for land restoration in eight countries: China, Colombia, Ghana, India, Nepal, South Africa, Tanzania and Thailand. In Vietnam, the project of installing bamboo wave barriers instead of Melaleuca poles is also being piloted and brings "dual" effects, both protecting the coast and helping people consume Melaleuca poles in Kien Giang. According to Ms. Bianca Schlegel, technical officer of the bamboo fence project in Bac Lieu: "The cost for 1 m of T-wave barrier is only about 60 USD, but it ensures durability for up to 4 years. The outstanding feature of this wave barrier is that it reduces the energy of waves by 60% when passing and is very effective in retaining silt and sediments for eroded beaches. In fact, the T-shaped bamboo poles at the coast of Vinh Trach Dong commune (Bac Lieu city) proved that after only 18 months, the beach area was eroded and flooded all year round (from Vinh Trach Dong to Hiep Thanh commune) has been deposited and greened by a forest of nearly 2.5 hectares wide, encroaching on the seaward of nearly 300 m [12].

With the superior values of bamboo as above, but according to our understanding, there has been no research on growing bamboo on eroding soil, especially in landslide prone areas in the Central region. Therefore, in this article, we present an overview of erosion caused by floods and storms occurring in Quang Binh Province and propose the planting of bamboo instead of acacia on that land.

II. MATERIAL AND METHODS

2.1. Methods of investigation and collection of information

Secondary data was surveyed with farmers, leaders of departments of communes and districts in Quang Binh province, and related people on the situation of landslides, on the area of *Acacia* plantation in the risk areas. This article, about the indigenous *bamboo* varieties and growth situation.

2.2 Map method

Collect current land use maps, administrative maps, forest planning from departments and agencies of Quang Binh province, then edit thematic maps using Mapinfo pro 15.0 software

2.3. Descriptive statistics method

From the results of the survey, the statistical data according to the parameters of the damage to people and property affected at the time of natural disasters, storms and floods, compared with the calculated data, processed thematic maps. of each district in Quang Binh province

III. RESULTS AND DISCUSSIONS

3.1. Situation of damage caused by floods and storms in Quang Binh Province.

In two consecutive floods of rain, especially the historic flood from October 16 to October 21, 2020 with great intensity (rainfall in many places over 1,000mm), long-term, exceeding historical milestones, flooded the area. In a large area, many headquarters of units were flooded such as: Nhat Le fishing port; Aquaculture Breeding Center; Nine water supply stations in Le Thuy, Ba Don, Tuyen Hoa and Bo Trach districts.

In Le Thuy district, the flood was deep and lasted for up to 6 days, inundating more than 32,000 houses. Quang Ninh district has more than 13,000 houses; There are more than 187 villages and hamlets of 44 communes and townships divided and isolated. Tuyen Hoa district has 23 villages/hamlets/of 13 communes. Bo Trach district has 41 villages and 10 communes and townships. Quang Trach district has Thuan Hoa village, Lien Truong commune, Kinh Nhuan village, Canh Hoa commune and all the villages of Phu Hoa commune. Dong Hoi city has 30 households in Loc Ninh commune and 57 villages [2].

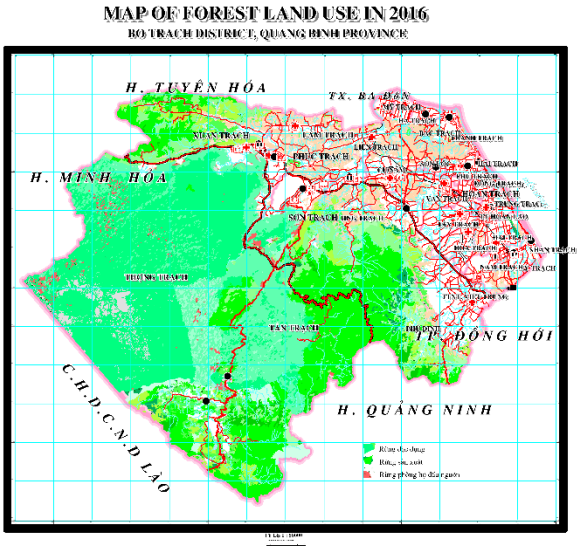

Figure 1: Forest land use map of Bo trach district, Quang Binh province, scale 1:50,000

Flooding also caused landslides, completely covering Thac Voi protection station of Truong Son branch; 19 houses in Tuyen Hoa district were damaged; 02 low voltage poles in Hung Trach and Xuan Trach communes of Bo Trach district; 20m fence of Ba Don Town Continuing Education Center collapsed; 02 landslide points on Nhat Le river (Dong Hoi city); many embankments and coastlines were eroded….

National highways through Quang Binh province have been heavily affected by floods and landslides, causing traffic jams such as National Highway 12C

The province's forestry sector with damaged plantations is 3,392 ha. In which, protection planted forest is 1,149 ha; Production forest is 2,784 ha; More than 20 million forestry seedlings were inundated due to floods, unable to recover; 17.2 km of forestry roads and 22 km of forest fire prevention and fighting roads were lost due to large purchases and flash floods.

Thus, the above statistics show that the situation of erosion and landslides caused by floods and storms in Quang Binh Province has caused people to be severely affected, not yet the COVID-19 epidemic has come to natural disasters, difficulties pile up difficulties, the burden of livelihood is still weighing on the shoulders of the people in the Central region.

3.2. Local remedial plan.

Realizing that the consequences of floods and storms are extremely serious, the Department of Agriculture and Rural Development has strictly implemented the Central Publications, and the Provincial People's Committee has issued many documents directing and guiding units to respond, to overcome floods (Decision No. 2340/SNN-KHTC dated October 12, 2020, Decision No. 2382/SNN-KHTC dated October 16, 2020, Official Letter 2431/SNN-KHTC dated October 26 on training). Directing units to thoroughly grasp the motto "4 on the spot"; arrange 24/24h duty, especially in production camps, move assets and agency documents to locations to avoid flooding; organized reinforcement of stations, camps, offices... After the flood, in the days from October 20 to 23, the whole sector focused on rescue and hunger relief for people with the motto not to let people die, hungry and thirsty; directing units to urgently overcome the consequences of floods in order to soon stabilize and estimate damage [2].

Faced with that situation, the Department has advised the Provincial People's Committee to focus on directing the restoration of production after floods, and soon stabilize people's lives with many solutions, specifically: Advise the Provincial People's Committee to propose and the Ministry of Agriculture and Rural Development, promptly supported 4.2 tons of vegetable seeds; 05 tons of glutinous corn seeds for replanting the lost autumn-winter crops; support 275,000 1-day-old chicken breeds, 100,000 duck breeds and 55,825 tons of animal feed. Along with that, the Government supports 654 tons of rice varieties, 127 tons of maize varieties, 12.2 tons of vegetable varieties to promptly deploy the production of the winter-spring crop 2020-2021; chemicals, vaccines, etc. Besides, the province deducts 20.25 billion dong from the budget and many organizations and individuals have provided financial and material support; So far, local farmers have basically bought enough seeds for winter-spring production. Currently, localities are focusing on directing production to ensure seasonality, seed structure, resolutely not to leave bare land, expected to reach 100% of the plan.

Actively direct the cleaning, disinfection and sterilization of the breeding environment, aquaculture ponds and lakes; forest sanitation, focusing on handling forestry seed nurseries to ensure seedlings for the 2020 afforestation plan; treat domestic water, repair damaged water supply works, promptly supply clean water to people; temporarily repair damaged irrigation works to prepare for the production of winter-spring crop. In particular, the Department has advised the Provincial People's Committee to submit to the Provincial Party Committee to issue Resolution No. 02-NQ/TU and Action Program of the Provincial People's Committee to implement Resolution No. 02-NQ/TU on overcoming the consequences of rain and floods. In addition, coordinate with localities to organize surveys and submit to the Provincial People's Committee an emergency migration plan for 04 resettlement sites at 04 serious landslide sites.

In particular, the Ministry of Agriculture and Rural Development together with the People's Committee of Quang Binh Province have provided financial support so that the locality has conditions to repair damage to forestry production works, support people in the affected area. soon stabilize life and develop agro-forestry production. At this time, we cannot think of a long-term plan for a reasonable crop conversion. However, Quang Binh Province has urgently assigned departments and agencies to implement forest planning from 2020 to 2030. With this plan in place, the implementation of new bamboo plantations on planted forest areas (mostly acacia) which were damaged by floods is only feasible and brings great efficiency and significance to the locality.

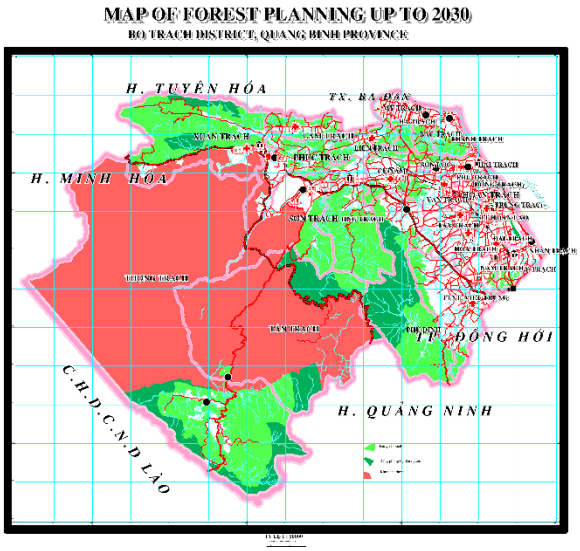

Figure 2: Forest planning map of Bo trach district in Quang Binh province, scale 1:50,000

For cultivation, promote the restructuring of crop production to be more practical and effective; continue to focus on removing bottlenecks and bottlenecks, especially land accumulation, actively seeking and calling for enterprises to invest in agriculture and rural areas. Strongly shifting to commodity production on the basis of bringing into play the advantages of each region and region; adjust the structure of plant varieties combined with a reasonable arrangement of seasons to avoid the disadvantages of weather and market signals; take advantage of hilly areas to build effective hill garden economic models; continue to give priority to the development of hi-tech agriculture, to give priority to the development of smart agriculture to adapt to climate change, to organic agriculture, to apply high technology and to biosecurity in production. Continue to direct localities to accelerate the transformation of crop structure associated with the market on the basis of promoting advantages; accelerate the conversion to fruit trees, medicinal plants and pepper in hilly areas. In the field of forestry, improve the quality of natural forests through forest protection, zoning and restoration; improve productivity and quality of planted forests; strictly manage the exploitation of planted forests, afforestation, change of forest use purposes to well protect and improve the quality of existing natural forests; well implement the targets of the environmental protection plan for sustainable forestry development; focus on developing material afforestation areas to ensure good service for wood processing factories, associated with large timber afforestation to increase added value from planted forest timber; calling on enterprises to invest in forestry services such as processing timber from planted forests, leasing forest environmental services; sustainable forest management and certification of plantation timber. Develop a plan to implement the program to plant one billion trees; implement forest valuation and develop a price bracket for all kinds of forests with the area of forest land to be valued at 542,409 ha (natural forest 469,623 ha; plantation forest 115,565 ha); surveying natural forests of rocky mountains and forests planted on sand that are qualified to become forests; advise the resolution of the

Provincial People's Council to decide on the policy of changing the forest use purpose to another purpose to implement investment projects in service of socio-economic development in the province; coordinate with relevant localities, agencies and units to completely handle violations related to deforestation; strengthen the management and protection of forests, resolutely prevent large deforestation and forest fires, and contribute to stabilizing forest cover.

The above are the options to overcome the immediate damage of localities in Quang Binh Province, but in the long term, we need to look at the cause of the annual floods and storms that are due to changes in climate. Therefore, it is very urgent to have a plan to both respond to climate change and ensure economic stability and development for people in flood-prone areas. According to scientists around the world, bamboo can make a significant contribution to combating climate change in developing countries, especially in rural communities. In particular, in Vietnam, bamboo is considered a symbol of our nation, which once caused a global shock when it gained independence from the two great powers France and the US. Bamboo has been internationally recognized as a tree of high sustainable value to mankind.

3.3. The role of bamboo in overcoming consequences caused by frequent storms and floods in Quang Binh Province.

Faced with the annual flood and storm situation in Quang Binh Province, it is extremely urgent to limit and prevent the impact of natural disasters on people's lives, while ensuring economic development. for areas that have been severely affected by climate change. Here, we offer a plan to plant bamboo to replace other trees in areas prone to erosion in order to overcome the consequences of natural disasters and at the same time bring outstanding economic benefits. Bamboo was chosen because it can help mitigate and adapt to the effects of climate change [12]. Bamboo can contribute significantly to combating climate change in developing countries, especially in rural communities. Specifically, the five benefits from bamboo are as follows:

Firstly, bamboo absorbs CO2. Bamboo grows fast and makes the atmosphere cooler and fresher by emitting 35% more O2 and absorbing 5 times more CO2 than large trees.

Second, bamboo replaces or reduces dependence on fossil fuels. Bamboo creates an environmentally friendly biomass energy source. Bamboo can provide a sustainable bioenergy source as an alternative to charcoal or briquettes. Bamboo can also be converted into gas or pellets, to provide a source of electricity and heating.

Third, bamboo has the ability to adapt and grow fast. Fast-growing bamboo allows for frequent harvesting, which allows farmers to flexibly adapt harvesting and management practices, generate a year-round source of income, and can be converted into a wide range of valuable products. as high as: laminated plywood; furniture; activated carbon. In particular, Bamboo sheet has light properties and linear separation which makes it easier to process than wood. Bamboo can be intercropped, requires little input, and grows back after harvest without replanting, making it a largely renewable resource.

Fourth, bamboo has the ability to effectively block wind, regulate water flow and prevent erosion, and has the ability to restore degraded land. Bamboo is indispensable to many natural and agricultural ecosystems in and near the tropics. Bamboo is useful for restoring degraded lands for a number of reasons: Bamboo thrives on steep slopes unsuitable for other crops; Bamboo is an effective windbreak, and its sturdy rhizomes can regulate water flow, preventing erosion. A recently recorded case in Allahabad, India, tells of the rebuilding of rural livelihoods where 80,000 hectares of degraded land was brought back to yield using bamboo as a pioneer species. Or in 2018, INbar published a report on the benefits of bamboo for land restoration in eight countries.

Fifth, bamboo is fundamental to economic sustainability. Bamboo is a versatile and rapidly renewable resource with a wide range of livelihood applications. The economic role of bamboo is increasingly confirmed when other forest resources are increasingly scarce and exploitation is limited to protect the earth against increasing climate change. Bamboo has different mechanical properties depending on the location of the sample in the stem. Certain products derived from bamboo, are currently available in Asia such as: fiberboard, fiber cement board, particle board, plywood for truck floors, braided board, plywood, glued laminate flooring, laminated beams, etc. Therefore, Bamboo is used in the construction sector, as a structural and decorative material or in the field of furniture or load-bearing structures. The test results show that the application of Bamboo is full of potential. Therefore, bamboo is an excellent alternative to building materials derived from biomass. Regarding agriculture, bamboo cultivation will be very effective if combined with forestry cultivation to develop bamboo forests in our country. The materials from bamboo are developed with high aesthetic appeal.

With the outstanding benefits of bamboo, we want to contribute to the revolution of bamboo, not only stopping at the applications of replacing wood and plastic, but also promoting the greening of bamboo forests in the regions. erosion land, softening the warming of the earth and especially helping Quang Binh Province in particular and Vietnam in general to overcome, minimize and prevent the severe consequences caused by storms and floods.

IV. CONCLUSIONS

The situation of erosion and landslides caused by floods and storms has brought extremely serious consequences to Quang Binh Province, the October 2020 storm has flooded 106,000 houses, 25 people died, and tens of kilometers of roads, landslides and floods. The total damage is estimated at 3,500 billion VND. This incident once again raised the alarm that there must be a plan to both respond to climate change and ensure economic stability and development for people in flood-prone areas.

Based on research by scientists around the world and the fact that bamboo has proven to have a superior role compared to other crops in areas prone to erosion land in order to overcome the consequences of natural disasters, at the same time bring outstanding economic benefits. Because bamboo absorbs CO2 gas; bamboo replaces or reduces dependence on fossil fuels; bamboo has the ability to adapt and grow fast; bamboo has the ability to effectively block wind, regulate water flow and prevent erosion, and has the ability to restore degraded land; and bamboo is the foundation for economic sustainability.

Therefore, we write this report to present an overview of landslides caused by floods and storms occurring in Quang Binh Province and propose to plant bamboo on that land in the forest planning of Quang Binh Province. This report also hopes to fill the research gap on the effects of bamboo in response to climate change in Quang Binh Province, and at the same time bring practical application meaning to help people in the areas of moderate floods and storms. overcome, minimize and prevent severe consequences caused by natural disasters, while stabilizing and sustainably developing the economy.

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