Biodiversity Risk and Opportunity Assessment in BAT Cooperative Tobacco-growing Areas

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Abstract Using the method in Biodiversity Risk and Opportunity Assessment Handbook of British American Tobacco Biodiversity Partnership, we assess biodiversity risks and opportunities in BAT and China's cooperative tobacco-growing areas. The assessment results indicate that there are 8 risks and 1 opportunity. Action and monitoring plans have been made for medium and high risks as well as opportunity, to reduce impact on biodiversity.

Key words BAT, Cooperative tobacco-growing area, Biodiversity, Risk and opportunity assessment

1 Introduction

Biodiversity risk and opportunity mean that some events with uncertainties have adverse or beneficial impacts on biodiversity due to some man-made or natural factors[1]. The biodiversity risk and opportunity assessment is to identify, assess and process the risks threatening biodiversity, make full use of opportunities, and develop action and monitoring plan, to reduce the threats to biodiversity and better conserve biodiversity[2]. British American Tobacco, known as BAT, cooperated with three non-governmental environmental protection organizations (Earthwatch Institute; Fauna & Flora International; Tropical Biology Association) to launch British American Tobacco Biodiversity Partnership in 2001. BAT contributes 1.5 million pounds to this union annually, and participates in many biodiversity conservation projects in the world. The union developed professional Biodiversity Risk & Opportunity Assessment Handbook, as a professional tool to evaluate the risks and opportunities of biodiversity. The biodiversity risk and opportunity assessment tool is used to assess the dependence and impact of operation within agricultural landscape on biodiversity, grade the possible risks and opportunities caused by such dependence and impact, and develop action and monitoring plan based on these risks and opportunities. From May to December 2014, by inviting the experts from Kunming Institute of Botany of the Chinese Academy of Sciences as consultant, BAT Far East Leaf Co., Ltd. launched the biodiversity risk and opportunity assessment activities in BAT-China cooperative tobacco-growing areas such as Qiubei County, Yanshan County and Guangnan County in Yunnan Province, Xingren County and Zhijin County in Guizhou Province, Dechang County and Miyi County in Sichuan Province.

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2 Principles and methods for assessing the biodiversity risk and opportunity

2.1 Screening and confirmation of the risk The assessment tool provides a worksheet that contains a variety of risks from agricultural landscape, terrestrial and aquatic habitats, terrestrial and aquatic species, soil structure and health, invasive alien species and other items. Through field surveys, consulting, access to information and discussion, these risks are judged with "Yes" or "No" to confirm the risk.

2.2 Risk and opportunity assessment and sorting We carry out assessment and sorting of these risks and possible opportunities. Based on the probability of the risk and the degree of damage, we use biodiversity risk matrix to grade the risks (see Fig. 1). 6-9 (high risk); 3-4 (medium risk); 1-2 (low risk).

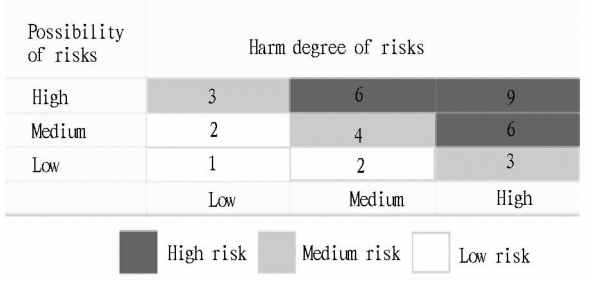

Fig. 1 Biodiversity risk matrix

2.3 Developing of action and monitoring plan For the medium and high risks, it is necessary to develop action and monitoring plan to reduce or offset the impact on biodiversity. We do not need to develop the action and monitoring plan for low risk, but if this low risk may evolve into medium and high risk, we must develop an action and monitoring plan. Developing the action and monitoring plan can reduce or eliminate impacts on biodiversity by avoiding, reducing, recovering, offsetting and additional conser-

vation projects (see Fig. 2). (i) Avoiding. There are a variety of measures to avoid impacts on biodiversity. For example, we can avoid the planting of tobacco or other crops on slopes steeper than 15 °, so as to reduce the risks to biodiversity. (ii) Reducing. We can strengthen soil testing and formula fertilization to reduce fertilizer application, and implements GAP management and IPM to reduce pesticide use, thereby reducing the risk to soil biodiversity and reducing the impact on soil biodiversity. (iii) Recovering. We can recover some abandoned buildings, construction sites, etc., and try to re-plant trees or crops, to gradually recover biodiversity. (iv) Offsetting or additional protection opportunities. By cooperating with governments, research institutions, universities and NGO, we can provide funding or manpower and participate in biodiversity conservation projects to better protect biodiversity.

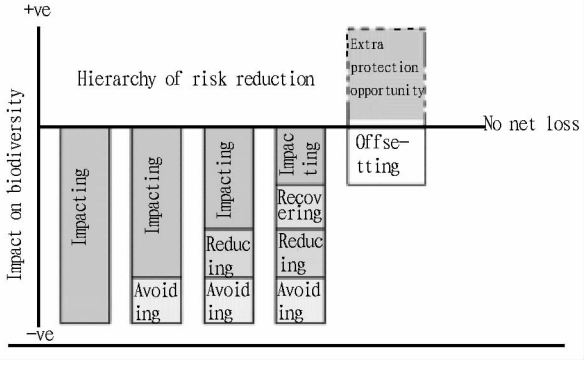

Fig. 2 Hierarchical schematic diagram of biodiversity risk reduction

3 Biodiversity risk and opportunity

In this assessment activity, we find 8 risks affecting biodiversity and 1 opportunity. Risk 1 (large-scale contiguous planting of a single crop)[5]; Risk 2 (lack of natural vegetation buffer zone on the edge of some farmland); Risk 3 (open-air burning of straw); Risk 4 (invasive species spreading); Risk 5 (soil erosion due to wind, rain and landslides); Risk 6 (contamination of residual soil mulching film); Risk 7 (lack of river embankment or natural vegetation buffer zone on both sides of the river); Risk 8 (number and type reduction of natural aquatic species due to fishing); Opportunity (implementation of GAP management to reduce Risk 6). In the above 8 risks, 5 of them have score ≥3, belonging to the medium and high risks, and there is a need to develop the action and monitoring plan to mitigate the negative impact of these risks on biodiversity. Other risks have score of 1-2, belonging to low risks, and there is no need to develop an action and monitoring plan. For one opportunity, there is a need to develop action and monitoring plan.

4 Cause and influence of risks

For the medium and high risks with the score ≥3, there is a need to develop action and monitoring plan. We now analyze the cause and influence of these risks. Risk 3 (open-air burning of straw). Some farmers often burn the crop straws after harvesting crops, because preparation of soil needs the plant ash or it is a habit. However, there is a huge risk. Firstly, it affects the soil microorganisms and soil biodiversity. Secondly, it may lead to mountain fire or forest fire, causing a greater threat to biodiversity. In addition, it also causes the environment pollution. Risk 4 (invasive species spreading). In the assessment area, the main invasive species include *Eupatorium adenophorum Spreng*, *Eichhornia crassipes*, *Alternanthera philoxeroides* (*Mart.*) *Griseb*, *Lantana camara* L., *Parthenium hysterophorus* L., *Pomacea canaliculata Spix*, *Procambarus clarkii* and the like. These invasive species came to China via Vietnam, Myanmar, and Taiwan from the early 19th century to the 1980s, and then gradually spread around. The invasion and spread of invasive species affect the growth and reproduction of native species, and local biodiversity. Risk 5 (soil erosion due to wind, rain and landslides). It lacks vegetation buffer strips around the soil or the crops are planted in too steep areas. When there is heavy rainstorm or strong wind, it easily causes landslides and soil erosion. Risk 6 (contamination of residual soil mulching film). At the early stage of crop growth, using mulching film can promote crop growth and increase production, so the mulching film is widely used in agricultural production. In the course of using mulching film, the strict GAP management and environment-friendly production methods are implemented on tobacco but not other crops such as peppers and corn, leading to contaminated soil by residual film. Through the field surveys and interviews, it is found that residual film exists in soil, there is risk of contamination, and some plots have been slightly polluted. Risk 8 (number and type reduction of natural aquatic species due to fishing). In addition to human predation and other reasons, the government lacks effective regulation and guidance, and local residents lack awareness of environmental protection and biodiversity protection, resulting in dwindling number and type of aquatic species in rivers, lakes and other water bodies. Through field surveys and interviews, it is found that the richness of protists in rivers and lakes such as fish, crabs and aquatic insects is reduced.

5 Action and monitoring plan

(i) For Risk 3 (open-air burning of straw), the goal is to eliminate straw burning in the field in the assessment area and make farmers realize the risks and hazards of straw burning in the field. The action and monitoring plan is as follows: sharing *Biodiversity Risk and Opportunity Assessment Implementation Report* with local government departments; training farmers so that farmers understand the risks and hazards of burning straw and eliminate the phenomenon of burning straw in the field. (ii) For Risk 4 (invasive species spreading), the goal is to prevent the proliferation of the alien invasive species in the assessment area and make local government and residents understand the impact of the alien invasive species on native organisms. The action and monitoring plan is as follows: sharing *Biodiversity Risk and Opportunity Assessment Implementation Report* with local government departments and tobacco companies; cooperating with the tobacco companies and organizing

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change people's attitude towards forestry work, and make people willing to do forestry work. Secondly, it is recommended to raise remuneration of forestry workers, and provide adequate securities for various interests and rights of grass-roots workers, to retain existing talents and prevent loss of talents. Thirdly, it is recommended to improve working environment of forest regions, construction of infrastructure because excellent working environment can attract more talents to engage in forestry construction.

4.3 Increasing afforestation area and making reasonable utilization planning From the above analysis, we know that afforestation area exerts negative influence on forestry economic growth, which is inconsistent with actual situation. Forestry economic growth is inseparable from forestry development and utilization. Expanding afforestation area exerts a positive role in forestry economic growth of Jilin Province. In the context of energetically implementing conceding the land to forestry, expanding afforestation area has excellent implementation guarantee. Therefore, it is recommended to promote forestry economic growth through making proper planning for expanding afforestation area of Jilin Province. At current development level of science and technology, it is necessary to establish a reasonable conversion system, to reflect forestry output conditions in a more systematic and comprehensive manner. In addition, it is recommended to improve afforestation and utilization in scientific operation and management manner.

4.4 Strengthening input of forestry science and technology and construction of policies and institutions Nowadays, science and technology are powerful factors influencing economic development. Therefore, it is recommended to take full advantage of technological progress, and increase input in science and technology for forestry in Jilin Province. Government should formulate policies and institutions to support forestry economic growth, to realize better development of forestry. China should strengthen financial support for agricultural and forestry universities and colleges, to cultivate forestry talents, and reinforce grass-roots construction of scientific and technological work of forestry, so as to improve management level of forestry operation.

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an activity in six tobacco producing areas in Qiubei County of Yunnan Province and Dechang County of Sichuan Province to eradicate *Eupatorium adenophora Spreng.* and other alien pests and make local residents realize the harm of alien invasive organisms. (iii) For Risk 5 (soil erosion due to wind, rain and landslides), the goal is to stop the soil erosion and restore natural vegetation surrounding soil. The action and monitoring plan is as follows: discussing with the tobacco companies and farmers to avoid planting tobacco in the plots with slope greater than 15°; applying green manure to improve soil in winter. (iv) For Risk 6 (contamination of residual soil mulching film), the goal is to eliminate contamination of residual soil mulching film and make farmers realize the hazards of contamination of residual soil mulching film and consciously implement film uncovering management in the late crop growth period. The action and monitoring plan is as follows: communicating with the tobacco companies and local agricultural departments and pointing out the hazards and seriousness of contamination of residual soil mulching film; carrying out the survey and writing reports on contamination of residual soil mulching film and sharing reports with the tobacco companies and local agricultural departments; urging farmers to clean residual plastic film when using mulching film. (v) For Risk 8 (number and type reduction of natural aquatic species due to fishing), the goal is to stop excessive predation of natural aquatic organisms, effectively protect and rationally use natural aquatic organisms. The action and monitoring plan is as follows: informing the relevant departments of any violations of relevant laws and regulations to catch and feed on aquatic organisms; organizing reforestation in the regions with rich aquatic organisms in the cooperative tobacco-growing areas to prevent water sources from pollution and better protect aquatic organisms. (vi) For Opportunity (implementation of GAP management to reduce Risk 6), the goal is to ensure that there is no residual film contamination to soil, and make local agricultural department technical staff and farmers understand the requirements of GAP and consciously implement management. The action and monitoring plan is as follows: conducting GAP management training for the technical staff and farmers in the assessment areas; strictly implementing GAP management in the crop production process.

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