Restoring Biodiversity in Coffee Plantations: A New Global Deal Promoting Shade Coffee

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This proposal is for the UN convention of biological diversity, because it has near universal participation among countries. The UN used its powers to organise a climate deal amongst its participants, it would therefore seem reasonable that it would be able to exert the same authority to organise a biodiversity too.

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Department of Global Sustainable Development

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Source: https://lapazgroup.net/2013/06/12/robusta-liberian-arabica/

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Executive summary

A need to protect biodiversity is higher now than ever before, evidence suggests we have already majorly surpassed the planetary boundary or safe operating space, and there is no sign of biodiversity loss slowing down. This is particularly worrying because a loss in biodiversity make the planet's ecosystem more vulnerable to other changes, and this will lead to non-linear change, negatively affecting ecosystem services which humans rely on to survive, develop and thrive. Rainforests are vital habitats that host a vast array of biodiversity and are essential to providing many livelihoods of the indigenous population. Coffee is primarily grown in these areas and research has shown that the type of shade management used on plantations has a significant effect on biodiversity, which we know is crucial to protect. Existing governance used to promote shade coffee is limited and relies on ethical producers and consumers to buy in. Although there is growth in shade coffee, it is nowhere near fast enough to protect the biodiversity we currently have in the rainforest. A global deal should be created to secure the future of our biodiversity and ensure that farmers are still able to make a living; this would include richer countries paying in, so poorer countries which are specifically located where coffee is grown, can fund farmers in the creation of shade coffee plantations, in the name of protecting biodiversity and the agroecosystem's sustainability as a whole. This would include increasing vegetation diversity on coffee plantations, maintenance of natural forest within close proximity of coffee plantations, and increased education of both producers and consumers on the effects unsustainable practices have on biodiversity.

Foundational Science, Discussion & Analysis

Why must biodiversity be protected?

The concept of planetary boundaries, devised by Rockström, et al. (2009), proposes thresholds for nine different environmental processes. If we stay below these thresholds Rockström suggests that we would be operating in a safe space for earth, and for the systems we rely on as humans to continue to work. Planetary boundaries are intrinsically interconnected, meaning that if one boundary is surpassed, non-linear environmental change is likely to occur across different planetary boundaries. This is essential to understand when talking about biodiversity loss; a loss in biodiversity lowers the threshold for other planetary boundaries, because biodiversity provides resilience for other environmental processes (Rockström, et al., 2009, pp. 1, 14-15). Scientists have identified biodiversity as one of the two core planetary boundaries, this is because the impact of transgressing this boundary will have a catastrophic impact on the planet's environment and its ability to provide ecosystem services (Steffen, et al., 2015, p. 737).

Biodiversity is essential to human life, this is because it provides many ecosystem services, these are the benefits that humans get from their ecosystem, and include provisioning, regulating, supporting and cultural, and are essential to almost all aspects of human life such as food production and disaster management (Jacob, et al., 2016, p. 92). Clearly, biodiversity is essential to the Human Development Agenda, as people rely on these services to live in, make a living out of and even to cure people's health problems. The current rate of biodiversity loss is exceeding the planetary boundary for biodiversity loss by 10-100 times (Rockström, et al., 2009, pp. 14-15), showing that immediate action is needed to protect the biosphere and prevent catastrophic impacts on the rest of the environmental system. Tropical rainforests support a disproportionately large proportion of biodiversity (Buter, 2006), therefore it is crucial that we protect biodiversity here, in order to maintain the ecosystem services that allow populations to thrive in these regions and around the world.

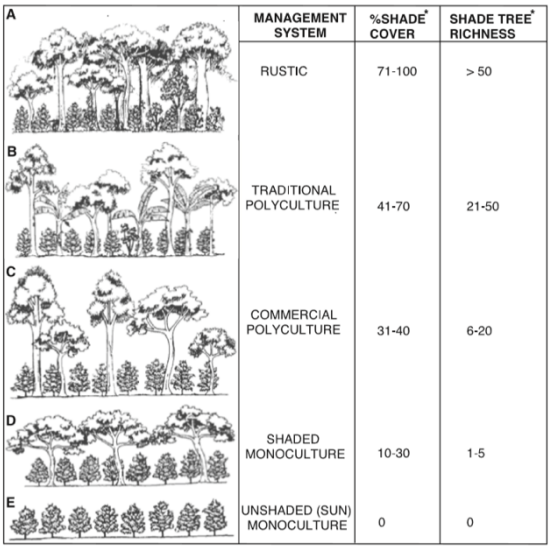

Figure 1*: diagram of coffee management intensities.* (Perfecto, et al., 2005, p. 438).

Coffee management's effects on biodiversity.

There is an increasing demand for crops that are exclusively grown in the rainforest, such as coffee. Many people rely on growing coffee for a living; therefore it is essential that these jobs still exist so those people do not fall into poverty, but ensure they can grow coffee more sustainably. Cultivating these crops requires manipulation of the forest which affects the ecology and therefore biodiversity there (Jha, et al., 2014, p. 416). The agroecosystem: the organisms and environment of an agricultural area (Merriam-Webster, 1949), in coffee plantations differs from the natural ecosystem; biodiversity (of ants and birds) has been seen to fall in coffee agroecosystems, with the exception being 'rustic coffee' plantations (see fig.1), where species richness of ant and bird species was seen to mimic that of nearby forests (Philpott, et al., 2008, p. 1093). It has also been found that species diversity and population numbers of small mammals is

higher in shaded coffee systems than unshaded (see fig.1) (Caudill, et al., 2014). This is because the shade and tree diversity provides the birds with nesting space, shelter from predators, and food, attracting them to the area (Philpott, et al., 2008, p. 1101).

Biodiversity of trees and the shade they provide brings animal biodiversity, bird diversity and populations rise in shade coffee plantations compared to unshaded plantations, this attracts birds' predators as there are more food resources in the area. Therefore, it has been found that shade coffee is important for the biodiversity conservation of arthropods, amphibians, resident and migratory birds, and mammals (Tejeda-Cruz, et al., 2010, p. 1).

Shade coffee is also more sustainable than conventional coffee because higher bird populations will act as natural pest controllers, and tree diversity will mean the soil will benefit from a wide range of decomposing leaves and their nutrients, this means that farmers will not have to use as much pesticide or fertiliser. This will make production of coffee cheaper for the farmers and the negative consequences of nitrogen in fertilisers will not be felt by those who rely on nearby rivers or lakes.

Assessment of Existing Governance

Today, sustainably or ethically grown coffee is promoted widely through certification schemes. This can be observed when visiting a coffee shop or buying coffee in a supermarket, the most popular seen 'ethical coffee' is triple certified: Fairtrade, Rainforest Alliance and Soil Association certified. Most major brands are now triple certified, as the market is almost self-regulatory, as consumers will often choose the coffee they believe is somewhat sustainable for moral reasons (Lyon, 2006, p. 1). The growth of this 'sustainable' coffee market is considerably larger than that of the market for non-certified coffees (Giovannucci & Villalobos, 2007, p. 3), this provides us with the potential to incorporate shade grown coffee into the mainstream of sustainable coffee and encourage more farmers to grow their coffee in the shade to protect biodiversity.

Shade grown coffee is largely endorsed through certification initiatives, primarily the "Bird Friendly" label established by The Smithsonian Migratory Bird Center, and focuses on shade cover of crops and species diversity in plantations (Craves, 2006), essentially promoting coffee systems a and b (see fig.1). The certification requires a canopy at least 12m high, 40% shade cover throughout the year, have at least 10 woody species in the production area, at least two layers of vegetation and be organic (Craves, 2006), they also forbid the conversion of primary forests to coffee plantation (Tejeda-Cruz, et al., 2010, p. 1). However, unlike other certifications such as those triple certification group, the shade coffee certification fails to offer coffee farmers guaranteed price premiums for their coffee, rather the certification gives them a 'tool' for negotiating a better price (generally between 5 to 10 cents/ pound (Craves, 2006)). As a

consequence of this, the majority of shade coffee growers are part of an established alliance which provides farmers with the financial assistance and training they need to compete on the market with other speciality coffee (Lyon, 2006, p. 3). This puts farmers who do not receive these incentives to grow shade coffee in a disadvantaged position; widening economic inequalities, and leaving the poorest communities at risk to declining biodiversity, meaning they benefit less from ecosystem services and are at risk of becoming even poorer (Sanderson, 2004, p. 325). As a result, poorer farmers or those who do not receive financial assistance feel growing shade grown coffee would be financially unsustainable. This is because it is a common misconception that increasing shade cover reduces yield. However, it has been found that yield is optimised between 35 and 65% shade cover, whereas rustic farming with more shade is detrimental to yields which may put farmers off (Perfecto, et al., 2005, p. 439).

More education is needed for farmers, to teach them that shade can benefit both their coffee and biodiversity of their agroecosystem, and the ecosystem services that come along with increased biodiversity of both vegetation and animals. Shade coffee is rarely promoted by government organisations, this means that policy is not being created to protect biodiversity in coffee plantations and instead requires ethical businesses to buy into the idea, on top of their current certifications which cost them money (Raynolds, et al., 2007, p. 147), this shows a need for policy to ensure that coffee plantations are a host rather than a deterrent of biodiversity.

Governance Recommendations

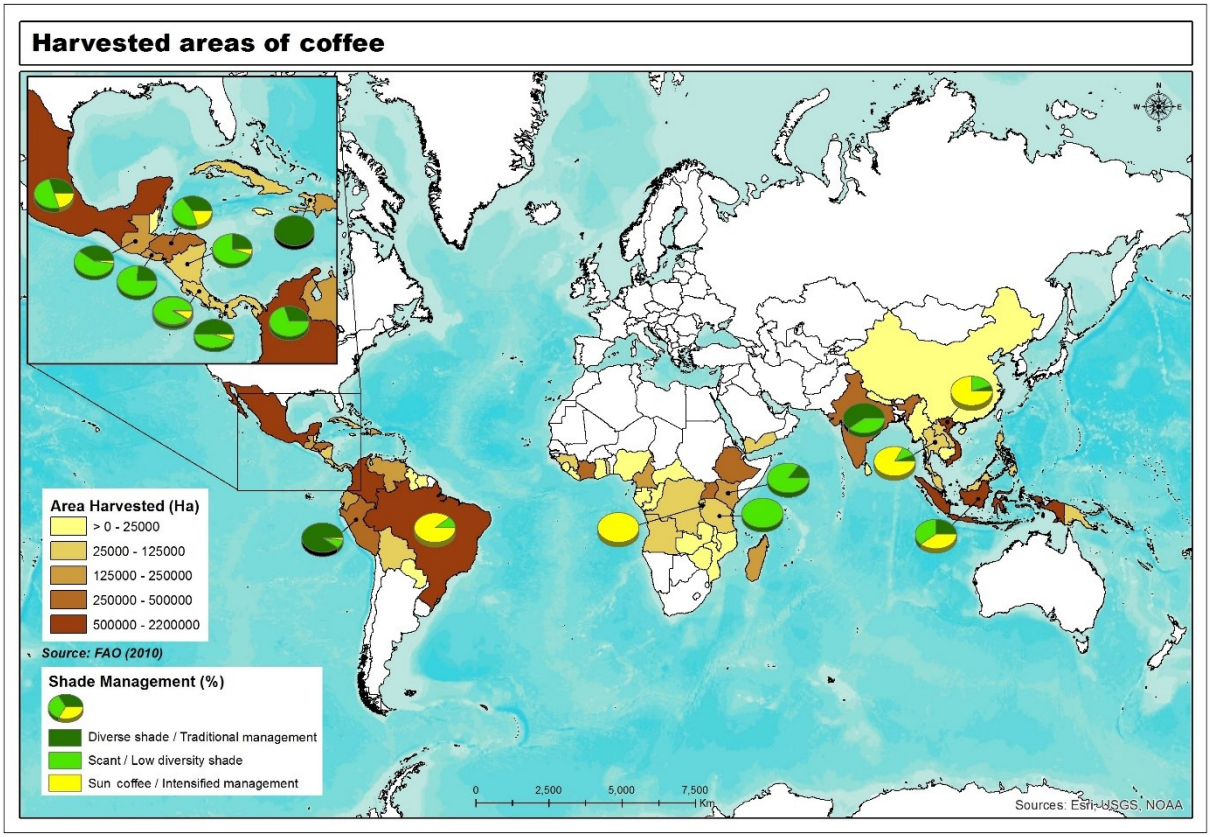

Figure 2: Map of the world showing coffee at different management and shade intensities. *(Jha, et al., 2014, p. 419)*

Fig.2 shows that 'sun' coffee is popular around the world, notably in Brazil and China, this creates a biodiversity issue. Scientists have proposed a global deal for nature to preserve biodiversity, much like the Paris climate change deal. In order to protect biodiversity and prevent the looming sixth mass extinction, they suggest that we need to drastically increase the amount of land that is protected and manage conservation efforts on that land (Hance, 2018). This deal should be conducted by the Convention of Biological Diversity (CBD), making the deal global so all countries are committed to protecting their biodiversity (Hance, 2018), this could include the conversion of sun to shade coffee plantations in countries which grow coffee, shown in fig.2.

There should be efforts to restore plant biodiversity in coffee plantations, with more layers of vegetation as this provides better conditions for forest species of animals. Native species of tree should be planted, and pruning discouraged to maintain shade, and habitat for the biodiversity (Philpott, et al., 2008, p. 1103). This is essential to attracting biodiversity into the plantation, and research shows that yield is in fact maximised at 35-65% shade (Perfecto, et al., 2005). Governments should create legislation requiring coffee farmers to have at least 35% shade cover because of this, as it is beneficial to crop yield and biodiversity in the plantation. Farmers should be given a range of different seedlings of native species for free from the government, and other

tools that will help them to maintain a shade plantation, as this will ensure that they are able to comply with regulations despite having to change their infrastructure. The funding for this should come from the international community, via the CBD, as this change will lead to benefits for everyone. Research into any additional costs, such as labour, is needed, and farmers should be reimbursed accordingly to ensure that they do not lose out in the name of sustainability.

The Bird Friendly coffee certification, which requires over 40% shade cover throughout the year, should also be more widely advertised, especially in consuming countries where people may be unaware of the effect their coffee choices have on biodiversity and subsequently the planet. This has worked with other certifications, which are now the norm in many places. The bird friendly certification should also come with a law binding fixed price premiums, this will give farmers more stability and encourage them to invest into maintaining their shade coffee plantation, with a wide variety of trees and vegetation layers.

Maintaining natural forests close to coffee plantations is essential, as the conservation value of shade coffee plantations is dependent on its proximity to natural forests (Tejeda-Cruz, et al., 2010, p. 2). This will provide a seed source for the trees in the shade coffee plantation, spread by birds once the shade coffee has been established (Philpott, et al., 2008, p. 1103). Also, when coffee plantations are 1 km or less from natural forest, the coffee benefits from wild pollinators, this has been shown to lead to yield growth of up to 20% and increase the consistency of the harvest (Foley, et al., 2005, p. 573).

Coffee farmers should be taught that shade coffee is not only better for biodiversity, but for maintaining the ecosystem services they rely on too. We must dispel the current myths surrounding shade's effect on yields and show them the short-term benefits of bringing biodiversity into their coffee plantation. Such as growing fruit trees within their plantation as another source of income (this will also act as an enticement for animals as this is their food too (Tejeda-Cruz, et al., 2010, p. 2)), or the fact that higher bird biodiversity and populations will mean that pests are controlled, reducing their need for pesticides, and the broad range of decomposing leaves on the forest floor will make their soil more fertile, reducing the need for fertilisers, making production cheaper and more environmentally sound.

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