Community-based Approach to Climate Change Adaptation: Agroforestry in Indonesia

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Introduction

Climate change is a major threat to food security and agricultural production globally. The impacts of climate change are more severe in developing countries, particularly in Indonesia, where many communities rely on agriculture for their livelihoods. Climate change has affected Indonesia in several ways, including but not limited to rising temperatures, changing rainfall patterns, and increasing frequency and severity of extreme weather events such as droughts, floods, and cyclones. The SouthEast Asian nation, along with most of the planet, is being forced to identify and implement fast-acting and large-scale strategic adaptation efforts to protect their people and country in the coming decades.

Community-based adaptation (CBA) is "an approach to strengthening the adaptive capacity of local communities vulnerable to climate change. The CBA approach increasingly features in discussions among policy makers, planners, advocates, and researchers, and has been endorsed and adopted by numerous governmental and non-governmental organizations" (Kirkby 2018, 577). Agroforestry is a unique CBA strategy to address the impacts of climate change in Indonesia in that it serves as an effective climate mitigation and carbon sequestration technique while it simultaneously offers methods in which to equip the local people with much needed independence, financial stability, and food security. This literature review explores the theoretical and empirical literature related to agroforestry as a community-based adaptation option for Indonesian social, economic, and environmental vulnerabilities in the face of the climate crisis.

The Logic Behind CBA and Agroforestry in Indonesia

CBA is a valuable climate change adaptation strategy in Indonesia with aims to empower local Indonesian communities to manage and reduce the risks of climate change through their active participation in adaptation efforts. CBA outlines efforts to work alongside communities to identify and prioritize their adaptation needs, and to develop and implement adaptation strategies that build on their existing knowledge and capacities (Forsyth 2017). The approach is revolutionary for international

adaptation strategy in that it is grounded in the notion that communities are best placed to identify their unique vulnerabilities and develop strategies that are appropriate for their specific contexts. This is because communities have local knowledge and experience of the impacts of climate change, as well as the capacity to mobilize resources and implement actions at the local level (Adger 2005).

The CBA strategy works by involving local communities in the planning, implementation, and monitoring of adaptation measures. It recognizes the importance of local knowledge, expertise, and resources in building resilience and adaptive capacity. By involving local communities in adaptation efforts, the CBA strategy seeks to ensure that the adaptation measures are appropriate, relevant, and sustainable. The CBA strategy recognizes that adaptation is a long-term process that requires continuous learning, monitoring, and evaluation (Adger 2005). The proposed CBA strategy to alleviate the impacts of the climate crisis, agroforestry, is the integration of trees and crops or livestock on the same land, providing multiple benefits such as soil conservation, biodiversity conservation, and carbon sequestration (Pantera 2017). Agroforestry is a viable community-based adaptation strategy to be pursued in Indonesia in that it works by enhancing ecosystem services and by increasing local resiliency to climate variability and disturbances.

The Evidence of Agroforestry as Effective

Agroforestry is an incredibly promising CBA strategy to alleviate the devastating impacts of the climate burden being carried by Indonesian communities in that it "allow[s] for diversity-based climate adaptation through increasing farmer portfolios at the farm level, and increasing multi-functionality of land uses in the landscape" (Noordwijk 2016). In other words, agroforestry provides small-scale and smallholder farmers with a method of diversified income, which in turn, works to reduce their reliance on a single crop and increases their resilience to crop failures and market fluctuations. The agricultural practice can provide multiple products, including food, fuel, and timber, and can also generate additional income for farmers. This can help to address the economic vulnerability of farmers and their communities where profitability of lifestyle and stability of income have long been major hurdles to their household's and their own well-being: "it was claimed that farmers reported reduced income fluctuations amongst

poorer smallholders adopting agroforestry techniques. Furthermore, comparison of a slash & burn cyclical system and a sisipan agroforestry system (involving the planting of young rubber trees between well-established ones) found that 99% of the respondents considered that the sisipan system allows for greater continuity in revenue streams" (Duffy 2021).

Additionally, a fundamental way agroforestry addresses climate change is through carbon sequestration. An independent scientific research investigating the relationship between carbon sequestration metrics and various methods of agriculture has led to the conclusion that agroforestry can sequester up to 50% more carbon than conventional farming systems, making it an effective tool for climate change mitigation (Nair 2010). Trees absorb and store carbon dioxide from the atmosphere, reducing the amount of greenhouse gases in the atmosphere, providing shade and cooling, and reducing heat stress for crops and livestock. In agroforestry systems, trees are integrated with crops or livestock, creating a more diverse and resilient agricultural landscape. Moreover, this diversity enhances the capacity of agroforestry systems to store carbon, which can help mitigate climate change.

Similarly, agroforestry can be effective in enhancing soil health, reducing the risk of soil erosion, and working to address the environmental vulnerabilites associated with climate change in Indonesia. Agroforestry systems promote the recycling of nutrients and organic matter, which can increase soil fertility and reduce the need for synthetic fertilizers and the Jambi Agroforestry Project is a brilliant example of this. The Jambi Agroforestry Project aimed to promote agroforestry practices among smallholder farmers in the Jambi province of Indonesia, with the goal of improving their livelihoods and reducing their vulnerability to climate change.

The project involved the establishment of mixed-species agroforestry systems, which integrated various tree species with crops and livestock. The Jambi Project, in practice, demostrated that agroforestry systems can help stabilize soil, increase crop yields, reduce the risk of soil erosion, enhance biodiversity by providing habitat for wildlife, and improve livelihoods for farmers (Nugroho 2016). This is particularly important for this region of Indonesia, where deforestation and land degradation have led to significant soil erosion, loss of soil fertility, and the exacerbation of experienced extreme weather events.

The project helps to emphasize the potential to implement agroforestry methods in more regions of Indonesia in efforts to combat the felt influence of climate change for the local people and allow them to adapt to changing environmental conditions, such as drought and flooding, that have long devastated their traditional agricultural practices.

Challenges to the Widespread Use of Agroforestry

While agroforestry has the potential to provide multiple benefits such as increased food security, improved livelihoods, and reduced greenhouse gas emissions, there are several challenges that need to be addressed for it to be effectively implemented in Indonesia. Firstly, agroforestry requires a long-term investment, which may not be feasible for small-scale smallholder farmers who lack financial resources. Secondly, agroforestry requires knowledge and skills that many farmers may not possess, which can be a barrier to its adoption. Therefore, there is a need for capacity building programs that will provide farmers with the necessary skills and knowledge to successfully implement agroforestry practices. Thirdly, agroforestry may not be suitable for all agricultural landscapes in Indonesia, and site-specific approaches are needed to tailor agroforestry to local conditions. And lastly, there are concerns about the potential negative impacts of agroforestry on water availability, particularly in areas where water resources are already limited (Noordwijk 2016).

A further challenge of agroforestry in Indonesia is the need to balance competing demands for land use. Indonesia is a country with a growing population and increasing demand for food and other commodities. This has resulted in the conversion of forested land into agricultural land. Many farmers in Indonesia do not have formal land tenure, which can create uncertainty around land use and prevent farmers from making long-term investments in new agricultural practices. Agroforestry can provide an opportunity to balance these competing demands for land use, but it requires careful planning and management. Therefore, there is a need for policies and regulations that will promote sustainable land use practices, protect forested areas, and promote the use of agroforestry as an alternative land use practice.

Conclusion

In conclusion, climate change is a global phenomenon that has the potential to affect human societies at a global scale. Indonesia, being one of the most vulnerable countries to the effects of climate change, has been experiencing increased social, economic, and environmental vulnerabilities as a result of the exacerbation of the climate crisis. In order to combat this issue in Indonesia, it is important to pursue and prioritize community-based adaptation strategies in addition to relevant and more technocratic approaches to adaptation. CBA is a strategy that aims to empower communities to address the adverse effects of climate change by building their resilience and adaptive capacity. One example of a community-based adaptation strategy for Indonesia to combat the impacts of climate change is the implementation of agroforestry systems.

By promoting sustainable land use practices and providing multiple benefits, the evidence suggests that agroforestry has the potential to enhance the resilience of communities and ecosystems in Indonesia. Agroforestry is an interconnected approach to provide the Indonesian people with the tools to provide for their loved ones in times of a worsening crisis including providing methods for local farmer to diversify their crop yield and income, working to eliminate food insecurity, sequestering carbon from the atmosphere, improving soil fertility and reducing soil erosion risk, and positively impacting the health and biodiversity of local ecosystems. However, there are challenges to be addressed for it to be effectively implemented such as a need for finance, education, and capacity-building programs to facilitate a promising transition, the need to balance competing demands for land use, issues related to water, property rights, and land tenure. Therefore, there is a need for policies and programs that will address these challenges and support the successful and widespread application of agroforestry practices in order to best adapt and advocate for the health of Indonesian people and the planet in the face of the global crisis: climate change.

Word Count: 1197

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