Responding to Climate Change: Ecological Modernization in Bangladesh's Agriculture

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Abstract

Climate change is one of the biggest humanitarian challenges in many parts of the world. Unfortunately, low-income developing countries in the Global South will be the major victims, even though they are not the major driver of this global environmental change. It is not very uncommon that the people, community, and the country in the Global South are putting efforts to develop their own resiliency strategies to confront this challenge. With a regional focus on southwest Bangladesh, which is one of the major climate hot spots in the world, this chapter tries to explain climate resilient efforts particularly in agriculture sector with a lens of ecological modernization theory. The findings of this chapter highlight the importance of understanding ecological modernization as well as required process and mechanisms for climate resilient agriculture practice. Even though

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the findings are theoretically grounded, the focus is on how the theory can be translated with further modifications, if necessary, into local communities. It is expected that this chapter will have larger implications by generating further theoretical and empirical discourse focusing on low-income developing countries in the Global South.

Keywords

Bangladesh • Climate change adaptation • Climate change • Ecological modernization theory

Background

Changing climate and associated impacts are among the major humanitarian crises of our contemporary society. It can obviously make changes to our economy, society, politics, and environment at large. It will have influence on our food supply and the patterns of livelihoods. However, the impacts of changing global environment will not be homogenous. People in the low-income developing nations will face larger exposure and vulnerability. Even though in most cases poor people are not the major driving forces for environmental or climate change, unfortunately they will be the major victims of this changing environment.

Climate policy, or more generally nation's environmental policy, is increasingly intertwined with the logic of ecological modernization (Curran 2009). While in Bangladesh the term "ecological modernization" is not officially adopted or widely used, the nation's climate policy or climate adaptation debate increasingly takes place within the larger domain of ecological modernization. In the present context of climate vulnerability and risks, the logics and promises of ecological modernization have never been so compelling. Like many other social sciences theories, this is also not an exception from criticisms and proposals for refinements.

This particular chapter reviews the perspectives of ecological modernization with a regional focus on southwest Bangladesh. Climate resilient agriculture is at the core of this discussion. As the major share of population are predominantly engaged in agriculture-related activities, changing pattern of agriculture has large implications on society and economy. Bangladesh is one of the most densely populated and poorest countries in the world (Streatfield and Karar 2008; Clayton 2013). One in every three Bangladeshis is poor and the ratio is slightly more in the rural areas (Clayton 2013). Despite huge population and pervasive poverty, the country has demonstrated progressive trajectories towards growth and development, based on a number of development indicators, such as the Human Development Index (BBS 2007). On the contrary, the global environmental change, e.g., climate change, can jeopardize the country's current trend with social and economic progresses.

It is one of the most vulnerable countries due to extreme climate events. Low-lying topography of the southwest coastal landforms of Bangladesh suggests

that minimal increase in sea level can have catastrophic impacts on the coastal communities and the country at large (Abedin and Shaw 2013). One meter rise in sea level can be the reason for landlessness of 14.8 million people. That can also make 40 million people internally displaced due to the loss of 29,846 km^2 of land area in largely coastal areas (Brown 2011). The majority of the affected people will be poor that are dependent on local and regional natural resources such as fisheries, forestry, agriculture, etc.

In this changing situations of climate, agriculture, the major economic base in the country, can be affected severely followed by damages to many other livelihood opportunities (Brown 2011; Madhu and Jahid 2010). In Bangladesh, agriculture is a climate-sensitive sector. It is dependent on seasonal weather variability (Abedin and Shaw 2013). Due to the changing pattern of climate, rice production in Bangladesh is predicted to fall by 8 % and wheat production by 32 % until 2050 (Climate Change Cell 2009).

Southwest Bangladesh is often treated as the most disaster-prone region in the country due to its exposure to extreme climate events in coastal areas, such as salinity intrusion, increased intensity and frequency of tropical cyclones, tidal surges, floods, repeated water logging, etc. Approximately ten million people live in this region. Apart from this, the region is treated as one of the poorest regions in the country. Often the regional poverty dynamics is shaped by the ecological conditions and entitlements. The Sundarbans, world's largest mangrove forest, is one of the major suppliers of livelihood opportunities to majority of the coastal population, illustrating people's interactions and dependencies on nature and natural resource as a whole (Pravda Bangladesh 2009). Extreme climate events will eventually have adverse impacts on this regional resource base and at the end will disrupt this coupled human and natural system in local and regional scale.

To confront climate challenge, now Bangladesh is also focusing on climate resilient agriculture to feed its burgeoning population. Often this comes with different forms of ecological modernization such as agriculture intensification. The available lands for agriculture are not abundant in Bangladesh. This illustrates that there are not many options available for horizontal expansion of agriculture; rather vertical expansion is often treated as the most affordable option. Vertical expansion of agriculture, a form of intensification, can be perceived within the larger framework of ecological modernization. Bangladesh is a cosigner country with the Kyoto protocol along with other major environmental treaties, and therefore, the country is legally bonded for its improvements towards ecological efficiency.

In a low-income developing country like Bangladesh, there usually exists a huge vacuum to conceptualize the ecological modernization theory with implications. People often strive for sustainability without any substantial theoretical focus. As a consequence, society experiences the malpractices and implications of innovations and technological advancement. The theoretical development of ecological modernization was largely taken in the western European countries. Till to date, there is little to no research discussing the Global South and its connection to climate change adaptation mechanisms.

This chapter is an attempt to contribute to the discourse of ecological modernization focusing on the Global South, where the majority of the world population resides. This chapter discusses how climate resilient agriculture can be discussed within the larger framework of ecological modernization theory in the context of southwest Bangladesh. Even though the findings in this chapter are largely theoretically grounded, however, it is intended to focus on how the theory can be translated with further modifications, where necessary, into local communities of the Global South.

Local Environmental Challenges

Bangladesh is often characterized by her yearly monsoon patterns. Therefore, in Bangladesh, agriculture is largely treated as a weather-sensitive sector. Even though local agriculture is heavily dependent on monsoon rains, excessive monsoon rains can cause substantial crop damages. Therefore, delay of plantation and damage of produced crops are among the most significant losses due to the unpredictable pattern of monsoon rains. Often it creates massive flash floods. The flood in 1988 caused the reduction of agriculture production by forty-five percent. In a resource-constrained country like Bangladesh, it was a big national security challenge. The country became heavily dependent on food exports and aid for meeting the local consumption demands. However, flood in this extent is not rare in Bangladesh. In the recent years, the frequency and the extent of floods have substantially increased (Fig. 1).

Apart from floods, tropical cyclones and storm surges can also make damages to agriculture. The Cyclone Sidr struck the coastal Bangladesh on November 15, 2007. The total damage of crops was approximately Bangladesh Taka 28.4 billion (76 BDT = 1 US$), and the total loss of production in all crops was 1.3 million metric tons (Madhu and Jahid 2010). Natural hazards like floods, droughts, cyclones, etc. are likely to increase in frequency and in intensity due to the changing nature of climate (Abedin and Shaw 2013; IPCC 2007), and it is not a surprise that these disasters will generate further challenges for agriculture in Bangladesh (Abedin and Shaw 2013). Salinity intrusion is another major environmental challenge in the region. If it generates regional humanitarian crisis due to the lack of drinkable water and cultivable land, then southwest coastal Bangladesh will be treated as one of the major climate hot spots in human history. A migration from coastal Bangladesh to other parts of the country is already an increasing phenomenon. Lack of drinking water and salinity intrusion in land and water are shaping this migration dynamics. This process with salinity intrusion can be further increased by the reduced dry-season freshwater supply from upstream sources resulting from climate change (IPCC 1998) as well as by the increasing salinity intrusion due to sea-level rise (Abedin and Shaw 2013). These mentioned environmental challenges, heightened mostly due to climate change, will gradually contribute to the fact of decreasing amount of available agriculture lands.

In addition to that, population growth and unplanned and uncontrolled urbanization also contribute to the declining trends with prime agriculture land.

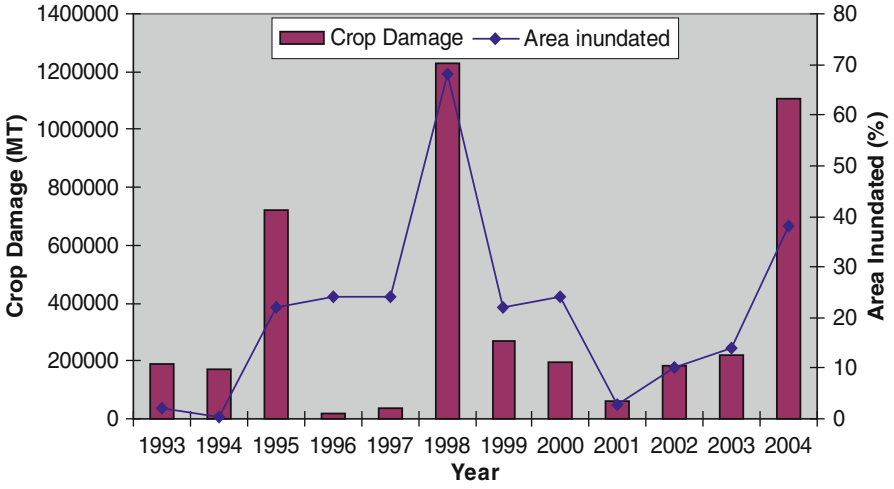

Fig. 1 Crop damage (in metric ton) due to historical flood (Source: Madhu and Jahid 2010)

Right now the declining rate of agriculture land is approximately 1 % per annum (Ahmed 2010). The land use change from farm to nonfarm activities is another phenomenon in this land-constrained country. The loss of agricultural lands and the adverse impacts on overall agriculture warn us about the possible future food shortage for the country's growing population. An emerging middle-class population will likely consume more and that will eventually increase the demand for consumption in the entire country. The conflict or mismatch between demand and supply of agriculture products will most likely increase the country's vulnerability to further social, economic, and political chaos (Fig. 2).

The national picture of agriculture challenges is not very different in southwest coastal Bangladesh. The region is the home of 35.1 million people (Bangladesh Bureau of Statistics 2011). The majority of populations are poor, mostly marginalized farmers and fishermen, or dependent on other natural resources. The net cultivable lands are 1.95 million hectares. This average landholding per household is half of national average (Abedin and Shaw 2013).

Possible Solution: Climate Resilient Agriculture

As the climate change is not any more a theoretical or abstract concept, rather very much visible in regional context, the southwest Bangladesh is in urgency to focus on different climate resilient agricultural practices (Mahmood 2006). However, evidence shows that in the southwest coastal areas, the evaluation and demonstration of climate resilient high-yielding rice varieties have been neglected until recently (Clayton 2013). Fewer farmers adopted the modern agricultural practices and mostly remained lock with traditional agriculture practice (Clayton 2013).

Fig. 2 Southwest coastal area of Bangladesh (Source: CoastalCare 2011)

It is important to reinforce that climate resilient agriculture practice will reduce substantially the risks and vulnerabilities associated with climate change (Abedin and Shaw 2013) and that is particularly relevant and have larger implications in the low-income developing countries where the adaptive capacities are extremely limited. Climate resilient agriculture can contribute to four strategic objectives: it can contribute to ensure the production of adequate food for the bourgeoning population; alleviation of poverty particularly among the poor and marginalized farmers can be promoted; access to food will help to achieve better health and nutrition; and finally, it contribute to conserve the local natural resource base, which is not only helpful for the environment, but can also contribute to the local productivity, economy, and long-term sustainability (CGIAR 2011).

Even though the climate resilient agriculture has a paramount importance, the implications of modernization and associated consequences are not very clear to the local policy makers and also to the farmers. This makes the situation complicated, because without understanding the process of (ecological) modernization, the local society might end up by generating further negative impacts on nature, such as loss of biodiversity.

Business-as-usual can no longer any effective mechanism to understand the context and challenges. Innovative concepts and practices are required therefore for a region's sustainability. Evidence shows in the southwest coastal regions, improving water efficiency and crop diversification should be at the core of local adaptation efforts (Abedin and Shaw 2013; Fig. 3).

Apart from environmental dimension, climate resilient agriculture has social dimensions. In some situations, it is primarily driven by social forces like local consumption pattern or profit-oriented production systems. Changing agricultural

Fig. 3 Floating agriculture practice (Source: Rahman 2013)

pattern can alter this conventional trajectory. The entire process of climate resilient agriculture should be conceived as a coupled interaction between human and nature. One-dimensional approach of climate resiliency can disrupt the entire systems of sustainability. Agricultural modernization (or ecological modernization) largely depends on how the people can link their eco-efficiency of production system with the market force. It is not an easy process; rather it involves farmers' awareness and engagement with climate resilient farming practice along with the state and policy supports for coupled understanding of modernization and long-term impacts.

Theoretical Framework: Ecological Modernization

Core Arguments

Joseph Huber was among the first group of ecological modernization theorists who put substantial importance on the role of technological innovations in environmental reform. Even though the theory of ecological modernization presents a complex array and understanding of postindustrial modern society, however, the core argument involves contemporary technological innovation. Therefore, the proponents of ecological modernization see continued industrial development as the best possible option for escaping from the advanced societies' ecological crises (Fisher and Freudenburg 2001).

Ecological modernization can be one of the major reference points in contemporary social sciences disciplines for analyzing society-environment interactions (Mol and Sonnenfeld 2000). A large share of ecological modernization literature has been

developed by the sociologists, and therefore, the theory or the perspective has become influential within the subdiscipline of environmental sociology (Buttel 2000).

Initially ecological modernization perspective emerged as the hegemonic environmental discourse focusing on the advanced developed societies. Gradually, it shows its prospective neoliberal solution to the global environmental crisis, such as climate change (Lippert 2010). The core argument of the ecological modernization is to reach a balanced and synergistic relationship between industrialized societies and their environment. Therefore, these developed societies need to engage with nature more techno-scientifically efforts. At the same time, the market economy should mediate the process (Lippert 2010). In summary, the core arguments of ecological modernization could be as follows:

> An ecological modernization perspective hypothesizes that while the most challenging environmental problems of this century and the next have (or will have) been caused by modernization and industrialization, their solutions must necessary lie in more – rather than less – modernization and 'superindustrialization.' (Buttel 2000, p. 61)

The logic of ecological modernization entails a postmodernist perspective. The ideological development surrounded on the perceived inadequacy of neo-Marxist interpretation schemes. Ecological modernization perspective challenges the core ideas of de-modernization (Mol and Spaargaren 2000). The core of ecological modernization illustrates that increasing industrialization can solve contemporary environmental problems. An ecologically modernized society should adopt the core principles of environmentalism in the design of locally available institutions to regulate human interactions with nature (Mol and Spaargaren 2005). Therefore, a vibrant local market economy and democratically elected government, along with constitutionally guaranteed rights and freedoms, are basic prerequisites for realizing ecological modernization. It is clearly evident that ecological modernization theorists highlight the process of structural change in economic, political, and cultural institutions that can directly influence the environmental outcomes. These propositions are closely aligned with the contemporary sustainable development agenda and initiatives where substantial importance on institutions and institutional capacity is clearly evident (Mol and Spaargaren 2005). Proponents of ecological modernization believe that currently we are exposed to ecological modernization and, to tackle global environmental challenge, we need more modernized efforts in terms of eco-efficiency (Lippert 2010). So far the empirical evidences of ecological modernization are largely from advanced industrial societies. One of the major reasons is that ecological modernization requires advanced technological development, a state regulated economy, and widespread environmental consciousness and behavior for the desired green industrial restructuring.

Criticisms

The logic of ecological modernization is not beyond criticisms. It argues that eco-efficiency can be achieved without radical structural changes in state and

civil society (Buttel 2000). A majority of criticisms are surrounding to this argument. Therefore, if we really need to understand the theoretical arguments of ecological modernization and its implications on some specific geographical context, it is also important to discuss the counterarguments of ecological modernization.

Firstly, the perspectives of ecological modernization differ from neo-Marxist social theories in paying little attention to changing relations of production or to altering the capitalist mode of production altogether. Therefore, ecological modernization perspective misses the point, how modernization exploits labor and resource base for the sake of increasing profits. In addition to that, the proponents of ecological modernization also believe that some institutions and/or organizations will become more "ecologically rational" at the later stages of development or modernization. However, developing countries might respond to this differently. Even though at the later stage of modernization it can be ecologically rational, that process of development already can make substantial damages of resource base with the exploitation of labor and production interaction, where the working class usually get exploited by the capital class. This process of development can actually generate increasing phenomenon with the treadmill of production. Apart from that, evidence shows that ecological modernization efforts were mostly successful to produce solutions to "conventional" environmental problems such as surface water pollution and solid waste management; however, high-consequence risks like climate change can only be explained with more rational integration of social and natural systems.

Neo-Marxist perspective also criticizes ecological modernization because it overlooks the effect of modernization by additions to and withdrawals from nature (Schnaiberg 1980). For example, modern production systems require greater material inputs, e.g., fertilizers. It is capital intensive, and hence, more energy is needed to run the system. It is intended to increase the production levels, thus requiring far more raw materials. Usually agricultural intensification (modernization) can lead substantial chemical additions to the nature. It can generate environmental problems, such as natural resource depletion and pollution of land and water. This can adversely impact the land's productive capacity.

From the very beginning the major critique of ecological modernization theory is the technological optimism as well as perceived technocratic character (Mol and Spaargaren 2000). It is mostly based on the invention, innovation, and diffusion of newer technologies and associated techniques of operating industrial processes (Murphy 2000). This is clearly evident that ecological modernization advocates for super-industrialization. It will generate substantial pressure on economy, nature, and society, and at the same time, not all developing countries in the Global South can follow this modernistic trajectory with ecological modernization due to its own social, economic, and political situations. Without having some levels of economic efficiency, it is very hard to generate and/or promote ecological modernization. It can generate extra burden to the economy as well as to the society. More elaborately, even if the low-income developing countries follow the trajectory with ecological modernization, it will be interesting to explore at what cost and

what would be the implications for labor and production relationship. Will the modernization generate profits for the large corporates or continue to marginalize the working class people? Still the proponents of ecological modernization are not very clear on these questions focusing on Global South.

If we summarize the major critics of ecological modernization, we can see that there is no compelling evidence available from where see can see that the ecological sphere has been detached from the economic sphere in decision-making criteria. In addition to that, ecological modernization has focused narrowly on ecological issues by neglecting or overlooking other equally important components of social processes, such as social equity (Pellow et al. 2000).

Without considering these challenges, modernization can generate even further pollution by increasing environmental and economic loads to the working class people, who will be the major victims of adverse impacts of changing climate. Apart from that, in many of the developing countries, the quality of governance and political and social institutions is very weak to support the country's endeavor towards ecological modernization. It is a concern that might derail the ecological modernization efforts in low-income developing countries.

Perspectives on Bangladesh

In Bangladesh, ecological modernization is at the very early stage of conceptualization and implementation. The process is going through restructuring in the local sociopolitical context and challenges. Not only in developing countries like in Bangladesh but also in developed societies it is not very uncommon that agricultural modernization or intensification as part of ecological modernization without proper supervision can cause the loss of fertility of prime agriculture lands. By modernizing agriculture sector in Bangladesh, there is a big chance that the farmers will not be the ultimate beneficiary groups. Big corporates might consume the major share of profits. Apart from that, as the ecological modernization process is technology driven, it might disrupt the local community structure and practice.

Therefore, it is a critical issue for Bangladesh how the country can follow the trajectory of growth and modernization within the larger framework of ecological modernization. Even though the agricultural vulnerability is high and adaptation needs are paramount, very little efforts have made so far to understand the potentials of agricultural adaptation (Abedin and Shaw 2013) and more particularly from the theoretical point of view.

Since the very beginning of ecological modernization discourse, scholars identified two distinct patterns within this framework: weak ecological modernization and strong ecological modernization (developed by Christoff 1996, but also discussed in Blowers 1997; Mol 2001; Dryzek et al. 2002). Weak ecological modernization can be characterized for its sole focus on efficiency and technological solutions by promoting technocratic and corporatist patterns of decision-making. It is treated as an initiative to introduce a single, focused, nondemocratic, and closed-ended framework and initiatives on political and economic structures and development.

The core ideology of weak ecological modernization is to maintain both the political legitimacy and market competitiveness, because the state and market emphasize on environmental benefits through technological advancements (Schlosberg and Rinfret 2008). However, this narrowly defined ecological modernization reflects no significant changes to corporate or political structures and often provides minimal ecological outcomes (Christoff 1996). However in contrast, a stronger ecological modernization considers broad ranging changes to the society's institutional structures and economic systems (Schlosberg and Rinfret 2008). The process often involves open democratic decision-making by using precautionary principles of modernization, and in addition to that it involves opportunities for political development (Schlosberg and Rinfret 2008).

Within the discourse of ecological modernization, we can see that even if Bangladesh adopt ecological modernization perspective, the process entails the components of weak ecological modernization, because its framework narrowly focuses on how alternative technological advancement can enhance the agriculture productivity as well as local economy. This narrowly focused conceptualization of ecological modernization does not involve opportunities for broader societal change in response to changing climate. The current trajectory of ecological modernization in Bangladesh clearly misses the opportunity for conceptualizing the situation from a holistic perspective, and it argues on more importance for broader change with enhanced democratic governance on crucial issues (Schlosberg and Rinfret 2008).

Summary

Agriculture is the major defining factor for food security and social development in Bangladesh. The associated problems of agriculture are multifaceted. Therefore, responding to climate change is complex and interdependent. The local society needs to understand the coupled relationships of human and natural systems prior to any specific modernization efforts.

Ecological modernization is a relatively new concept, and in many ways it is an improved perspective towards sustainable development. It is obviously an attractive concept of modernization, because it provides us an alternative to the pessimistic connotations of development frameworks such as the treadmill of production and growth machine (Buttel 2000).

Considering the local economy, society and political structure ensuring "strong" ecological modernization is a challenging task in Bangladesh. It is important to mention that ecological modernization is not necessarily a uniform prescription for all sectors. It can work better in some particular sectors than others. Advanced developed countries with mature governance are in advantageous position for ensuring ecological modernization. Low-income developing countries have contrasting scenarios.

In Bangladesh, climate adaptation strategy particularly the climate resilient agriculture practice is very much aligned with the concept of "weak" ecological modernization.

To avoid further distress, it would be important for the local society to focus more on the "community-based" side of the process; that means, the process should be led by the local community. The technocratic approach of ecological modernization can generate further disarray in the system and society.

In general, the farmers of the southwest Bangladesh are now interested on innovation and adaptation of climate resilient agriculture practice, such as floating-bed cultivation system. It is a good sign for eco-efficiency responding to climate change. However, it is important to mention that to speedup the process, the market and state should continue further research and development on new varieties of saline- and flood-tolerant crops and strive to disseminate new information and skills among the farmers and local community to create locally conducive environment and precondition for "strong" ecological modernization in southwest Bangladesh.

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