

An Introduction to Agricultural Anthropology: Pathway to Sustainable Agriculture

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Abstract The ultimate goal of agriculture is to produce food. All of the agricultural practices are done by people. So, agriculture deals with crop and people who are engaged in agriculture. The aim of this article is to introduce a new branch of applied anthropology, which is Agricultural Anthropology as the breakthrough for sustainable agriculture. It also presents a clear understanding about the concept of Agricultural Anthropology and the inter link between Anthropology and Agriculture. A meta-analysis method was administered to obtain the objectives. Agricultural Anthropology deals with a techno-economic combination that explains the socio-cultural and ideological components and their interaction with the natural environment. The article argues that there is a strong relationship between agriculture and anthropology. It further contends that Agricultural Anthropology is necessary to conduct agricultural learning and research by using anthropological methodology especially for studying agrobiodiversity conservation, participatory and collaborative research involving farmers, farmers' technology adoption behavior, and historical study of some dangerous diseases and insect pest of crops. This article proposes that it is high time to integrate Agricultural Anthropology into agricultural sciences and its related disciplines for developing participatory technology for sustainable agriculture.

Keywords: *sustainable agriculture, sustainability, biodiversity, agricultural anthropology, anthropology*

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1. Introduction

Agriculture is an applied science which deals with all aspects of plants manufacturing such as farming, animal raising, fisheries, forestry, etc. It is also an art, technology, and business of producing plants and animals for economic reasons. As an art, it holds an understanding of the way to perform the functions of the village in a competent manner but does not necessarily include an understanding of the foundations actual in a skillful method. It uses all technological innovation designed on scientific concepts such as plants reproduction, manufacturing techniques, plants protection, business financial aspects etc as a science. Agriculture is the way of life of the non-urban population's production to consumption. But agriculture as a business aims to maximize the net return through the management over land, labor, the water, and capital, employing the understanding of various sciences for the manufacture of food, nutrition, fiber, and fuel. In the past few years, agriculture is commercialized to run as a business through mechanization. Sustainable agriculture is both a physical human necessity and a hotly contested cultural construct [1]. The agricultural scientists, sociologists, and anthropologists are searching interdisciplinary approach which stands all scientists in the same platform for addressing increasing and diverse articulation of farmers' sustainable livelihoods [2,3].

Anthropology deals with humanity. It explores the human experiences from the ancient period to contemporary forms of peoples' culture like agriculture and social life. It intersects the multiple approaches to the study of humankind—biological, social, cultural, historical, linguistic, cognitive, material, and technological like agricultural technology. It is an Integrative interdisciplinary discipline including four major fields like archaeological, biological, linguistic, and socio-cultural anthropology.

- Archaeological anthropologists deal with the evolution and historical changes to cultural and socio-political configurations, the materiality, and the stewardship and interpretation of cultural heritage.
- Biological anthropologists deal with the physical and biocultural aspects of humans, including biological aspects of agriculture, human health and well being; micro and macroevolutionary study of the human condition; relationships to other primates and agricultural biology.
- Linguistic anthropologists are concerned with the history and structure of human languages, the relationship between language and culture, cognitive and biological aspects of language, and other symbolic forms and media of communication and reasoning.
- Sociocultural anthropologists deal with human social and cultural diversity and the basis of these distinctions, in economic, political, environmental, biological; social roles, relationships, and social

transformation; cultural identity; cultural dimensions of domination and resistance; and strategies for representing and analyzing cultural knowledge [4].

Sustainable agriculture is an integrated system of plant and animal production practices having a site-specific application that will maintain their productivity and usefulness to society by resource-conservation, socially viable, commercially competitive, and environmentally sound condition. It meets human food and fiber needs; enhancing environmental quality and the natural resource based upon which the agricultural economy depends; making the most efficient use of non-renewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls; sustaining the economic viability of farm operations; and enhancing the quality of life for farmers and society as a whole. Main advantages of sustainable agriculture are low production cost, less risk of the farmer, less water pollution, ensuring very little or no pesticide residue and both short and long term profitability. Almost no research has been done to focus agricultural anthropology in the aspect of sustainable agriculture despite the importance of sustainable agriculture as a topic in the field of anthropology [5]. Therefore this article has been an attempt to address this issue. Major components of the sustainable agricultural system are:

- Soil and water conservation to prevent degradation of soil productivity
- Efficient use of limited irrigation water without leading to problems of soil salinity, alkalinity, and high ground water table
- Crop rotations that mitigate weed, disease and insect problems, increase soil productivity and minimize soil erosion
- Integrated nutrient management that reduces the need for chemical fertilizers improves the soil health and minimizes environmental pollution by conjunctive use of organics, inorganic, and bio-fertilizers.
- 'Integrated pest management that reduces the need for agrochemicals by crop rotation, weather monitoring, and use of resistant cultivar, planting time and biological pest control.
- Management system to control weed by preventive measures, tillage, timely inter cultivation and crop rotation to improve plant health.

1.1. Objectives of the Study

The broad objective of the paper is to introduce a new branch of applied anthropology, that is, Agricultural Anthropology as an academic discipline. The specific objectives are:

- To introduce a new branch of applied anthropology i.e. agricultural anthropology as an academic discipline.
- To explore the relationship between agriculture and anthropology.
- To determine the relationship between practices of agricultural anthropology and sustainable agriculture.

1.2. Research Methodology

This research study is descriptive as well as suggestive in nature. The meta-value analysis is administered to

determine the status of Agricultural Anthropology as an academic discipline and its role in sustainable agriculture. Information retrieval method is used to collect data. Various renowned databases like web of science, springer link, science direct, banglajol, ideas are extensively used to gather research data by using some important keyword such as applied anthropology, agriculture, agrobiodiversity, conservation, sustainable etc [6]. Mainly secondary resources have been extensively used consisting of journal articles, books, newspapers, periodical articles etc. An attempt has also been made to include the latest information whenever available.

2. Interlinks between Anthropology & Agriculture

Agriculture is the root of all culture due to food production, its origin and its effects on population and society. Two major revolutions are emphasized by Archaeologists in agricultural history viz. the Neolithic revolution in which plant and animal species are domesticated and agriculture spread and the Industrial Revolution that allowed food to be produced in ever greater quantities for a capitalist society [7]. Unique attention should be paid to the range of pre-industrial agriculture, some of the most important improvements of this type, ecologically and culturally, associate to the continuous procedure of agriculture industrialization. Although agriculture can relate generally to manufacturing in an area, such procedures are inextricable from farming, or garden manufacturing, and animal husbandry. Others continue this line of asking when considering the advanced agricultural technology, asking why and how agriculture production gets to this difference in performance, and exterior feedback. The various market, weather, and public concepts have been submitted to address this key issue in agricultural development. When considered as a public procedure, agriculture can be recognized as part of larger social components such as religious beliefs, state tasks, industrialization, urbanization, and the spread of worldwide capitalism. On the other hand, these public procedures can be seen as aspects of agriculture as well, especially when scholars analyze differences in access to the means of production, starvation, rights, and public organization as a reply to production and environment [8]. Developing capital intense agriculture, as well as some of its modern solutions, is of unique importance to public science as it seems to produce both thousands of food and socioeconomic hierarchies that re-imagine plants as organizations.

2.1. Agricultural Anthropology

The term "agricultural anthropology" was developed and adopted by Robert (Bob) Rhoades (1942-2010) to explain his own work to other social and biological scientists in the late 1970s and early 1980s, during his post as a Rockefeller Postdoctoral Fellow at the International Potato Center (CIP) in Lima, Peru [9]. Research protocols and policies in the Consultative Group on International Agricultural Research (CGIAR) system are largely catered and dictated by agronomists and biologists. It was not

long before Bob (in collaboration with a fellow post-harvest colleague, biologist Robert Booth) turned the CIP approach on its head, suggesting that research should both begin and end with the farmer instead of the top-down approaches that prevailed at the time [7]. Rhoades and Booth (1982) called their model ‘farmer back to farmer’ [10], which quickly became an early and popular participatory approach in agricultural development, leading to the formation of an entire new program in the CGIAR system directed by Rhoades and the diffusion of appropriate technologies to millions of farmers worldwide [7].

Rhoades defined agricultural anthropology as the relative, natural, and temporary study of the human look at farming action, concentrating on the communications of atmosphere, technology, and lifestyle within local and international meals systems, and it has the realistic goal of sensibly implementing this knowledge to improve the performance and durability of meals and fibers manufacturing. Rhoades [9] described Agricultural anthropology as “*the comparative, holistic, and temporal study of the human element in agricultural activity, focusing on the interactions of environment, technology, and culture within local and global food systems, and it has the practical goal of responsibly applying this knowledge to improve the efficiency and sustainability of food and fiber production. Agricultural anthropology views agriculture neither as a mere technical process nor even as a techno-economic combination, but as a complex human creation and the evolutionary process that includes equally important socio-cultural and ideological components in interaction with each one another and the natural environment. Agricultural anthropology is broader in scope than other agricultural disciplines which focus, and rightly so, on specialized and limited problems in agriculture.*”[9]

Agricultural anthropology emphasizes agriculture as both a technical procedure and techno-economic mixture by considering ideological elements which is directly connected with a human. “*Agricultural anthropology is broader in scope than other agricultural disciplines which focus, and rightly so, on specialized and limited problems in agriculture*” [7]. Rhoades emphasizes the conceptualization of agricultural anthropology by integrating agriculture and anthropology to solve upcoming problems in academically and farming practices. Robert Rhoades outlined on three styles throughout his recognized career: agrobiodiversity preservation [11,12,13], participatory and collaborative analysis [3,12,5], and the multilayered state policies of farming growth [3,6]. Three main works of Rhodes in the field of Agricultural Anthropology are “*Potato Eyes: Positivism Meets Poetry in Food Systems Research, Long in the Horn: An Agricultural Anthropology of Livestock Improvement, the preservation, and breeding of Pineywoods cattle.*”[9]

Veteto and Skarbo (2009) [5] conducted a study on the topic of agro biodiversity, building on Rhoades’s work in agrobiodiversity, cultural ecology, and ethnography in their article, “Sowing the Seeds: Anthropological Contributions to Agro-biodiversity Studies” [5]. By analyzing how varietal richness emerges from the history of social, economic, and geographic marginality. Crane [3] offered a critical reconsideration of Rhoades’s “farmer-back-to-farmer” model for the development of agricultural technologies and pointed out in agrarian anthropology with science and

technology studies that desirable socio-technical change can be achieved by participatory research engaging agriculturist and anthropologist by participatory approach within the farmer-back-to-farmer model. [3].

2.2. Application of Applied Anthropology to Agriculture

Agricultural Anthropology emphasizes on the conservation of agricultural biodiversity [14]. Anthropologists should have studied the pattern of agricultural change in a ten-thousand-year-time frame for solving a growing concern about genetic erosion and the catastrophic potential of uniformity in food systems [15]. The progress of “off-types” by human selection is the domestication itself through a revolution of the Neolithic that continues to this day [16]. That is why; agricultural biodiversity conservation research and study should focus on the plant kingdom and livestock diversity [17].

Agrobiodiversity deals with the overall genetic variation in agroecosystems and crop biodiversity. This field has generally been investigated by agro anthropologists. Notable exceptions to this trend include studies of local soil knowledge and soil classification systems [18] and a limited number of studies on animal biodiversity have been done [19]. The aspects of agrobiodiversity such as Ethno-entomology and local perceptions of agricultural diseases [20] provide fruitful areas for future study. Anthropologists have been interested in studying crop biodiversity for much of the discipline’s history [5]. Early ethnographers such as Harrington [21] made the economic uses of agro biodiversity the main focus of ethno botany from the 19th century until the 1950s. Ethnobiology as the study of the “*utilization of plant and animal life by primitive peoples*” [22].

Environmentalism and sustainability contain farming, food security, manufacturing, intake, marketing and submission problems, natural activity etc. When “global survival” is desired, it is the trouble of the sustainability of local societies and facts [7]. This is because “global” is described “according to a sense of the world distributed by those who concept it.” The term ‘Think globally, act locally’ represents that problems can be described at an international level and that troubles are similarly powerful for all areas [23]. Lawn main action is required for a maintainable change in an international viewpoint. Power framework needs to be analyzed vis-à-vis public, financial and epistemological control. There is a need to develop an ecologically maintainable society with social rights for all. Durability is an issue for international management.

Researchers found that old varieties of the crop were valued for a number of reasons like risk management, environmental adaptation, and adoption to local cultures and real worlds; but vulnerable to economic, cultural, or environmental factors that could threaten agrobiodiversity [24,25]. Farmers’ agricultural decision making was a key paradigm in agricultural anthropology in the 1980s [26] and has been an important topic for agrobiodiversity researchers now.

Homestead gardening is a small model of full farming due to containing crop, livestock, poultry, fisheries and other components which possess micro climates within farming systems that contain high levels of biodiversity than are found in the surrounding agroecosystem [5].

Agrobiodiversity has a great importance in agricultural anthropology due to some reasons like local crop varieties which act as a buffer against environmental variation, change, and catastrophe; resilient varieties; diversifying the existing resource base and facilitating better adaptation strategies etc. A more variable range of responses to climate change can be achieved by selection of high levels of genetic and cultural diversified species of the crop than commercial varieties and farming systems [27]. The relationship among integrated pest management interventions and other technical tools of farmers have been established with the development of Farmer Field Schools, farmer-to-farmer training, and other innovations by employing anthropological methodologies [28].

3. The Contribution of Agricultural Anthropology to Sustainable Agriculture

Sustainable agriculture integrates three main goals such as environmental health, economic profitability, and social equity (Figure 1). A variety of philosophies, policies, and practices have contributed to these goals, but a few common themes and principles weave through most definitions of sustainable agriculture. Today, this movement for sustainable agriculture is getting increasing support and acceptance within the food production systems.

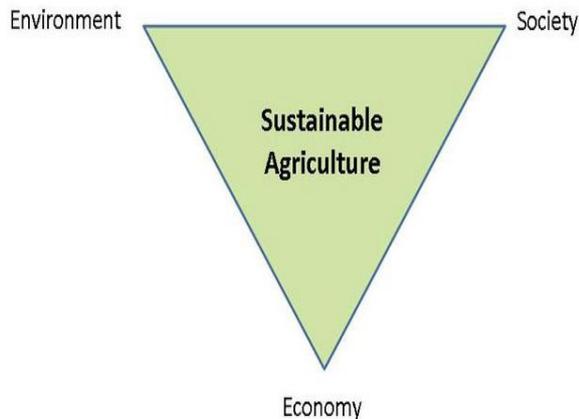


Figure 1. Sustainable agriculture gives equal weight to environmental, social, and economic concerns in agriculture. Source: Adapted from [29].

The main goal of agricultural sustainability is to address the needs of the present without compromising the ability of future generations to meet their own needs. Therefore, equal importance should be given to the maintenance of the long-term stewardship of both natural and human resources which includes consideration of social responsibilities such as the needs of rural communities, working and living conditions of laborers, and consumer health and safety both in the present and the future. It will also address concerns about animal welfare in farm enterprises that include livestock. An agroecosystems and food systems perspective are essential to an understanding of sustainability. Agroecosystems are the systems from individual fields to farms to eco-zones. Food systems include agroecosystems plus distribution and food

consumption components, similarly covering from farmer to global level [29].

Agrobiodiversity is closely related to agroecosystems which enables to assess to the impact of human society and its institutions on farming and its environmental sustainability [29]. Studies have shown that natural and human systems are highly resilient, adaptive, and have high diversity [30].

Resilience is an approach to recover the systems which are most critical like agroecosystems (including climate, pest populations, political contexts, and others) that are often highly unpredictable and rarely stable in the long run. Adaptability is a key component of resilience and ability to adjust itself and take a new form in the face of changing conditions when it may not always be possible or desirable for an agroecosystem to regain the precise form and function it had before a disturbance [29,30,31]. Diversity often helps adaptability whether in terms of types of crops or cultural knowledge, because the more variety that exists within a food system, the more tools and avenues a system will have to adapt to change [29]. A multi-pronged effort in research, education, and action are prevailing in agroecosystem and food system approach. Various levels of stakeholders, not only researchers from various disciplines but also farmers, laborers, retailers, consumers, policymakers and others who have a stake in our agricultural and food systems have crucial roles to play in moving toward greater agricultural sustainability [29,32].

The concept of sustainable development goes beyond the growth of the marginalized segments whose identification and success is at risk because of the devastation to the environment, forest reduction etc that were their environments. Sustainable growth involves problems with the environmental discrepancy, health and cleanliness, law and human rights, bio-degradation, public problems such as public balance, sex problems, hardship, and population etc. people need to be able to measure our growth model and downturn to achieve sustainable development. Development for people, in resources and social growth, include sustainable growth initiatives. Movements, both public and environmental are a step for growth and change. The term movement represents 'persistent, patterned and widely distributed challenges to the status quo' [33].

Finally, sustainable agriculture is not a single goal but it is an integration of social, economic and ecology components. Scientific understanding of what constitutes sustainability in environmental, social, and economic terms is continuously evolving and is influenced by contemporary issues, perspectives, and values [29]. For example, agriculture's ability to adjust to global warming was not regarded an important issue 20 years ago but is now getting improving attention. In addition, the information on what is really a maintainable system may vary from one set of circumstances (e.g., ground types, environment, work costs) to another, and from one social and ideological viewpoint to another, inducing the very phrase "sustainable" being a competitive phrase. Therefore, it is more useful and relevant to think of farming systems as varying along a procession from not sustainable to very sustainable, rather than placed in a sustainable/ not sustainable dichotomy.

3.1. Socio-cultural Compatibility

Kottak conducted a content research of the assessments of 68 development projects funded by the World Bank to evaluate the participation of "sociocultural compatibility" to venture achievements [34]. Sociocultural compatibility is known as the level to which the venture fit with local lifestyle and venture achievements were calculated in conditions of the monetary amount of come back. Those tasks assessed socioculturally suitable, with a confirmed knowing and research of social circumstances, were found to have an interest amount of coming back more than twice as high as those assessed lacking in these areas. One of the major problems with this research is, however, the very narrow definition of development, limited to the interest amount of come back on the lender's investment, and nothing about many of the other objectives of growth that may interest anthropologists, such as value, poverty evaluation, ecological sustainability, and power etc [32].

3.2. Social Analysis

Social analysis is often regarded as one of Anthropology's major contributions to donor supported development [35]. She also stated that social analysis requires the entire factors like economic, social, and financial for the success of a program. It represents both the desire and desirability of humans to meet up with themselves independently and jointly to the more their physical-emotional-intellectual abilities, and to do both as single individualities and associated to other individualities [36]. Franz Boas was amongst the first anthropologists, who stepped to convert the group into a better place to stay in. For Boas, the part of the anthropologist was both perceptive and moral: "*the advancement of reason through science and the conquest of tradition, irrationality, and injustice*" [37]. Franz Boas was involved with personal privileges, and personal independence, independence of query and conversation, equal rights of opportunity, and the beat of tendency and intolerance. He fought to advance a technology that would serve humankind. Boas used anthropological knowledge into action. He suggested that there isn't a transformative approach to a lifestyle which is in accordance to various cultures rather; each group has its own specific social standards and principles.

Both development Anthropology and development ethics, as well as human rights, have maintained to target the individual on the one hand describing the responsibilities and responsibilities of the state toward the person to a certain level, and on the other hand trying to list the necessary abilities that play a part toward the accomplishment of a person growing. Development principles relate to "the normative or ethical assessment of the ends and means of Third World and global development" [38]. One of Anthropology's precise plans is to provide a speech for those who are not heard, those who are usually ignored-the poor, the marginalized, the disenfranchised, those who are discriminated against. To reach out to the desperate should be the main concentrate of Applied Anthropologists. Development should be a relieving process that provides people with the chance to stay bigger, better, more significant, growing lives, with a particular concentrate on certain key capabilities: practical purpose, the creativity,

concern, group, rights, relationship, and freedom. Anthropology must re-conceptualize its involvement with growth and target the variations and solutions that may cause important difficulties to traditional designs and their actual principles [23]. As Corbridge has strongly and gracefully suggested modifying the whole world not only calls for an account of the whole world but also a concept about how the world might modify for the better [39].

3.3. Anthropology and Action

Anthropology as a self-discipline seemed to melt into a multiplicity of sub-disciplines with used significance like financial anthropology, medical anthropology, governmental anthropology, farming anthropology, and so on. Anthropology should be focused on the "real globe", to issue itself with public facts and problems. Generally research results are available in publications, dissertations and project reviews but practically not in use. The results of the research performed must be taken into account in actions of development and betterment of the society. Hence, it's time for an activity or else the effort entailed in gathering information and transforming into appropriate action. The plan of action is hypothetically set up but practicability missing. People are experiencing problems of emergency needs, ecological deterioration, climatic change, helps outbreak, melanoma and suffering from diabetes fatalities, increasing contamination and bronchial asthma, bio deterioration, depressive disorders and hypertension etc. All problems will be solved in terms of environmentally, economically and socially and make the globe a better position. There are more donors and development programs than at any previous time, but still there is more disorder and randomness and less order and balance in the community. The organizations such as the UN, FAO, UNDP, IPCC, private organization, government sector, CBOs and self-help categories are attempting to improve the community, control disfavor and endeavor for betterment for all both psychological and physical development [28]. The knowledge of agricultural anthropology will help to get eco-friendly living world where all the three components (social, economical and environmental) of sustainable agriculture can be improved equally [40].

4. Conclusion

Agricultural Anthropology has a vital role in managing agro-diversity, conservation agriculture, cultural memory, decision making of farmers, homestead gardening and farmers technology adoption behavior. This article argues that Agricultural Anthropology is necessary to understand the farming system and strategies as a holistic approach for achieving sustainable agriculture. The agricultural science discipline can be improved by incorporating agricultural anthropology as a major sub-discipline for better utilization of knowledge to the field level. It may provide an opportunity for connection among agricultural practices and research to society, environment, and economics. Though some social sciences like agricultural extension, rural development, and rural sociology are part of agricultural discipline these are not enough to address various issues related to sustainable agriculture. So,

Agricultural Anthropology may be a potential holistic subdiscipline for achieving sustainable agriculture. This new discipline needs the support of government and educational institution support to flourish so that all stakeholders get benefit from it.

References

- [1] Cleveland, D. A. (1998). Balancing on a Planet: Toward an Agricultural Anthropology for the Twenty-First Century, *Human Ecology*, 26(2): 2.
- [2] Sarker, M. N. I. (2016). Causes and possible solutions of seasonal food insecurity (Monga) perceived by char dwellers in Bangladesh. *International Journal of Ecology and Development Research*, 1(1): 002-009.
- [3] Crane, T. A. (2014). Bringing Science and Technology Studies into Agricultural Anthropology: Technology Development as Cultural Encounter between Farmers and Researchers, *Culture, Agriculture, Food and Environment*, 36(1): 45-55.
- [4] AnthroNotes (2006). Smithsonian Institution, Washington, DC. 27(2):6.
- [5] Veteto, J. R. & Skarbø, K. (2009). Sowing the Seeds: Anthropological Contributions to Agrobiodiversity Studies, *Culture & Agriculture*, 31(2):73-87.
- [6] Sarker, M. N. I. & Jie, Z. (2017). Social Security for Vulnerable Groups in Bangladesh on Government Perspective: Contribution of Research Leader. *Journal of Public Policy and Administration*, 1(1): 1-9.
- [7] Doddagoudra, S., Kulkarni, R. & Gubbi, M. (2017). *An Introduction to Agricultural Anthropology*, 5(1): 144-147.
- [8] Sarker, M. N. I., Bingxin, Y., Sultana, A., Prodhon, A. Z. M. S. (2017). Problems and challenges of public administration in Bangladesh: pathway to sustainable development. *International Journal of Public Administration and Policy Research*, 2(1): 008-015.
- [9] Rhoades, R.E. (1984). *Breaking New Ground: Agricultural Anthropology*. Lima, Peru: International Potato Center.
- [10] Rhoades, R. E., & Booth, R. H. (1982). Farmer-Backto-Farmer: A Model for Generating Acceptable Agricultural Technology. *Agricultural Administration*, 11: 127-137.
- [11] Brown, A. H. (2000). The genetic structure of crop landraces and the challenge to conserve them in situ on farms. *Genes in the Field*, 29-48.
- [12] Nazarea, V. D. (2006). Local Knowledge and Memory in Biodiversity Conservation. *Annual Review of Anthropology*, 35(1):317-335.
- [13] Veteto, J.R. (2008). The History and Survival of Traditional Heirloom Vegetable Varieties in the Southern Appalachian Mountains of Western North Carolina. *Agriculture and Human Values*, 25(1): 121.
- [14] Rhoades, R. E. (2005). Agricultural Anthropology. In *Applied Anthropology: Domains of Application*. S. Kedia and J. V. Willigen, eds. Pp. 61-83. Westport, CT: Praeger.
- [15] Rhoades, R. E. (1991). The World's Food Supply at Risk. *National Geographic*, April: 74-105.
- [16] Harlan, J. (1992). *Crops & Man*. Madison: American Society of Agronomy, Inc.
- [17] Brown, T. (2014). Long in the Horn: An Agricultural Anthropology of Livestock Improvement. *Culture, Agriculture, Food and Environment*, 36(1): 8-16.
- [18] Sillitoe, P. (1993). A ritual response to climatic perturbations in the highlands of Papua New Guinea. *Ethnology*, 32: 169-87.
- [19] Hoffman, S. M. (2002). Catastrophe and culturethe anthropology of disaster. In *School of american research advanced seminar series* (No. 303.485 C3).
- [20] Bentley, J. W. (1992). The Epistemology of Plant Protection: Honduran Campesino Knowledge of Pests and Natural Enemies. In *Proceedings of a Seminar on Crop Production for Resource-Poor Farmers*. R. W. Gibson and A. Sweetmore, eds. Pp. 107-117. Chatham, UK: Natural Resources Institute.
- [21] Harrington, J. P. (1947). Ethnobiology. *Acta Americana*, 5: 224-247.
- [22] Castetter, E. F. (1944). The Domain of Ethnobiology. *American Naturalist*, 78(775): 158-170.
- [23] Escobar, A. (1999). Beyond Nature: Steps to an Anti-Essentialist Political Ecology. *Current Anthropology*, 40(1): 1-30.
- [24] Bellon, M. R. (1991). The Ethnoecology of Maize Variety Management: A Case Study from Mexico. *Human Ecology*, 19(3): 389-418.
- [25] Alam, G. M. M., Alam, K., Shahbaz, M., Clarke, M. L. (2017). Drivers of vulnerability to climatic change in riparian char and river-bank households in Bangladesh: implications for policy, livelihoods and social development. *Ecol Indic*, 72: 23-32
- [26] Bennett, J. W. (1982). *Of time and the enterprise: North American family farm management in a context of resource marginality*. Minneapolis: University of Minnesota Press.
- [27] Kotschi, J. (2007). Agrobiodiversity is Essential for Adapting to Climate Change. *Gaia*, 16(2): 98-101.
- [28] Price, L.L. & Palis, F.G. (2016). Bringing Farmer Knowledge and Learning into Agricultural Research: How Agricultural Anthropologists Transformed Strategic Research at the International Rice Research Institute, *Culture, Agriculture, Food and Environment*, 38(2):123-130.
- [29] Brodt, S., Six, J., Feenstra, G., Ingels, C. & Campbell, D (2011). Sustainable Agriculture, *Nature Education Knowledge*, 3(10):1.
- [30] Alam, G. M. M., Alam, K., Shahbaz, M. (2016). Influence of institutional access and social capital on adaptation choices: empirical evidence from vulnerable rural households in Bangladesh. *Ecol Econ*, 130: 243-251.
- [31] Sarker, M. N. I. (2016). Knowledge, Adoption and Constraint analysis of Chilli Technology in Char Area of Bangladesh. *International Journal of Ecology and Development Research*, 1(1): 16-18.
- [32] Sarker, M. N. I. (2016). *Poverty of Island Char Dwellers in Bangladesh*. Hamburg, Diplomica Publishing GmbH, Germany. <http://www.anchorpublishing.com/e-book/318628/poverty-of-islandchar-dwellers-in-bangladesh>.
- [33] Veteto, J. R., & Crane, T. (2014). Tending the Field: Special Issue on Agricultural Anthropology and Robert E. Rhoades. *Culture, Agriculture, Food and Environment*, 36(1): 1-3.
- [34] Kottak C. P. (2002). *Anthropology. The Exploration of Human Diversity*. New-York: McGraw-Hill, Inc.
- [35] Nazarea, V. D. (2014). Potato Eyes: Positivism Meets Poetry in Food Systems Research. *Culture, Agriculture, Food and Environment*, 36: 4-7.
- [36] Bennett, J. W. (1996). Applied and Action Anthropology: Ideological and Conceptual Aspects. *Current Anthropology*, 36(suppl.): S23-S53.
- [37] Freeman, J. (2016). The Socioecology of Territory Size and a "Work-Around" Hypothesis for the Adoption of Farming. *PLoS ONE*, 11(7): e0158743. doi:10.1371/journal.pone.0158743
- [38] Sarker, M. N. I., Barman, S.C., Islam, M. M., Islam, M. R., Chakma, A. S. (2017). Role of lemon (*Citrus limon*) production on livelihoods of rural people in Bangladesh. *Journal of Agricultural Economics and Rural Development*, 3(1): 167-175.
- [39] Corbridge, S. (1994). Post-Marxism and post-colonialism: the needs and rights of distant strangers, in Booth, D. (ed) *Rethinking Social Development: Theory, research and Practice* (Harlow, Longman), pp 90-117.
- [40] Sarker, M. N. I., Ali, M. A. & Islam, M. S. (2015). Causes and possible solutions of poverty perceived by char dwellers in Bangladesh. *International Journal of Natural and Social Sciences*, 2(1): 37-41.