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Climate Change Concern to Cattle Feed in Bangladesh

[1]Ferdous Ahmed, [2,4]Abul Quasem Al-Amin, [3]Gazi Mahabubul Alam and [3]Che Hashim Hassan
[1]Institure for Graduate Studies, [2]Faculty of Economics and Administration,
[3]Unit for Enhancement of Academic Performance, University of Malaya,
50603 Kuala Lumpur, Malaysia
[4]Institute for Environment and Development (LESTARI), Universiti Kebangsaan Malaysia,
43650 Bangi, Selangor D.E., Malaysia

Abstract: This research focuses the climate change concerns for livestock feeding management in Bangladesh as it causes strange behavior and variation of cattle diets and feed shortages in the last two decades. It is obvious from the recent literature that Bangladesh is one of the most climate change vulnerable country of the world to climate change. It causes cattle feed shortages, modification in major production of yields, alteration in a variety composition of rangeland and edifying variety of cattle feed setback. The climate change concern to cattle feed in Bangladesh are now real and need to overcome the problems by the subject to current research effort and value. Therefore, in this study specific justification is used to figure out the factors that are responsible and discussed the national lacking, required action, limitation and possible alternative options. Moreover, following on the national lacking, required action and limitations, this study incorporated a framework of approach and strategies for the policy makers of Bangladesh.

Key words: Climate change, cattle feed, livestock farming, grazing land, community forestry, conservation, crop genetic resources

INTRODUCTION

Once there was a proverb that full granary of rice, enough cattle in the cowshed and fish abundance in the pond to represent the socio-economic conditions most of the rural people of Bangladesh. The proverb reflects the reality of truth even two decades ago in respect of countryside life for livestock in Bangladesh. During 1990's people could easily depend on natural resources for cattle feed and fodder as they had available around them of which most of them came from nature such as grazing land. However, still now people engaged with livestock farming but unfortunately the scenario has been changed due to the climate change impacts (Anower, 2008). The impact of climate change has been altered the environment where the grazing land and many of the plant species (herb, shrub and shrub related species) which are generally used as cattle feed and fodder and about extinct gradually from the nature. The study of the intergovernmental panel on climate change (IPCC, 2007) shows that the effect of climate change is real and it will bring more damage to the poorer and exposed people and Bangladesh is not an exception. The International Fund for Agricultural Development (IFAD) admits that climate causing huge destruction for pastoral deficiency and it requires tackling as the dispute (IFAD, 2010). The climate change influences harshly the poor people in developing country like Bangladesh who rely mostly on natural resources for their livelihoods (Al-Amin and Alam, 2011). Rural people immensely depend on agriculture for their continued existence and cattle maintenance which are the most climate reactive profitable sectors.

Still now most the demand of protein in the whole country comes from this livestock sector and it is contributing the remarkable revenues to the national economy (Al-Amin *et al*., 2012). However, due to climate change impacts most people who used to manage cattle farming are now becoming discouraged as they are fully dependent on market feed instead of natural for their livestock industry (Anower, 2008). The reality is that as there is no conserved grazing land available currently and unavailability of different grasses (both terrestrial and aquatic) are making them incapable to finance against their livestock feeding rather than financial benefits (Tareque *et al*., 2010). Together with climate change impacts, man-made causes are also creating extra impacts such as by deforestation, unplanned urbanization, monoculture of crops. Although, there is a simple debate

Corresponding Author: Gazi Mahabubul Alam, Unit for Enhancement of Academic Performance, University of Malaya, 50603 Kuala Lumpur, Malaysia

that livestock impacts on climate change but it is certain that climate change caused the vulnerable condition of the livestock feed and fodder (FAO, 2006). There are continuing huge researches on different aspect of livestock by the Bangladesh ministries, NGO's, livestock research institute and educational institutions but no enough research on cattle feed and fodder to meet the demand of the stakeholders depending on nature rather than purchasing feed from market. It is obvious that Bangladesh is one of the most climate change vulnerable country of the world (IPCC, 2007). It causes strange behavior of weather, repeated cyclones, natural catastrophes and also resulting variation of cattle diets and feed shortages, modification in major production of yields, rummage and rangeland, alteration in variety composition, eminence of plant resources, thrashing of inheritance and edifying variety and cattle strength (Rowlinson, 2008).

The climate change impacts result in many of the plant species including terrestrial and aquatic are becoming endangered in Bangladesh from the nature and most of which used to be cattle feed and fodder of livestock (Tareque *et al*., 2010). Although, climate change concern mounting due to the huge carbon emissions of developed countries which impacts Bangladesh severely but we can not ignore the mismanagement of different natural resources by dreadful human practices which causing environmental damage by deforestation and soil erosion by changing landscape and reducing cultivated land for accommodations. In the consequences lot plant species including grasses are extinct from the nature and it is affecting the cattle feeding (Once there were about 20 species of grasses, 15 species of plants easily found in the nature for using as cattle feed and fodder but day by day it is decreased dramatically due to the climate change). To enhance the sustainability of livestock sector cattle feed and fodder is very important. The challenge facing by the livestock sectors in Bangladesh is not a new issue. However, there are wide gaps exists that requirements and existing supports that are available and that kind gaps must be resolved to convene the development of inland demand. There are sufficient literature can be found by the research contests on the livestock industries and its sub-sectors (Hashemi and Davoodi, 2012; Roy *et al*., 2011; Gheisari *et al*., 2011; Al-Amin *et al*., 2011; Koknaroglu *et al*., 2011; Preciado *et al*., 2011; Sejian *et al*., 2011; Kioumarsi *et al*., 2011; Qiong *et al*., 2011; Karim *et al*., 2010; Tolunay *et al*., 2009; Kara *et al*., 2009; Lamidi *et al*., 2008; Rahman *et al*., 2007; MOFL, 2007; Nasrin and Rahman, 2003; DANIDA, 2002; Chilliard *et al*., 2001; Lund and Price, 1998).

These research findings are fundamentally address the issue on activities of genetic factors, the requirements of protein contents, species development, genetic parameters and genetic trends, identification of animal related diseases, disease influencing factors, disease context and remedial measures (Kor and Ziaei, 2012; Bayazit, 2011; Issi *et al*., 2011; Zidane *et al*., 2011; Meliani *et al*., 2011; Fang *et al*., 2010; Oner *et al*., 2010; Saber *et al*., 2009; Moeini *et al*., 2009; Demircan and Binici, 2009; Ragbetli *et al*., 2009; PCB, 2009; Al-Amin and Nahar, 2007; Taniguchi *et al*., 2007; Gizaw *et al*., 2007; Bozkurt, 2006; Ahuja and Montiel, 2005; Stevenson *et al*., 1994; Srikandakumar *et al*., 1986). However, the research and study are lacking on cattle feed and fodder which is alike important to the development of livestock industries.

Therefore, researchers have taken the initiative to find out the lacking by focusing on climate change concern for cattle feed in Bangladesh. Particularly, researchers have aimed to understand the potential initiative to establish gene bank for different grass and weeds and attention has been given to save endangered plant species which are usually use for fodder. We have also aimed to figure out the factors that are responsible in the drawbacks of effective policy for conserving grazing lands for cattle feed. Here, we have introduced an outline of strategies and guidelines that will be a way forward to overcome the problem by the subject to current effort, acts and ordinances in the constitutions so that instead having environmental threat it could possible to conserve specific natural resources for the wellbeing of livestock and value. We have introduced as well an outlook by potential agro-forestry following the multi cropping system or crop rotation, cultivating legumes and weeds in between two crop, homestead forestry to increase the abundance of cattle feed and fodder for the sustainable environment as well as cattle feed and fodder for livestock farming. The research will help to understand the fundamental problems, lacking and challenges to the concerned body and policy makers in Bangladesh.

MATERIALS AND METHODS

Outline of approaches: This study aims to focus the demand of cattle feed and resilient of climate change for sustainable livestock management of Bangladesh. In order avoid climate hazard which damaging natural resources of cattle feed, we need to establish a very effective national policy by which the way of implementation will be smooth. Besides we need some institutional alterations so that there is the opportunity to participate from all the communities to overcome the crisis for cattle feed as well as the concerns of climate change. It is vary apparent that

there is some lacking of the administration and policy development. Although, Bangladesh has some limitations and constrains with limited resources, it may develop potential option and strategies by adopting the following approaches for the abundance of cattle feed management with the threats of climate change.

Cropping system: Cropping system is an array of different crops where these are grown together in the same meadow. The cropping system can be implemented both dry field and normal conditions in Bangladesh (The demand of water for potential cropping system should be negligible for their regeneration and it should be survived in famine condition). The mix cropping system may have low crop production but it acts as a buffer against adverse conditions. This management system can be incorporated together drought tolerant as well as drought defiant plant species. As example Moong and Bajra; Guar and Bajra; Til and Guar can be harvested in the same field at a time. Therefore following this option, there are lots of crops which can be planted following the cropping system. There are some potential benefits of the mix cropping system. This system is sustainable against unfavorable condition like climate hazards. Sometimes it is seen that heavy drought brings famine for the rural people where is found no cultivation and cattle feed also becomes unavailable in this period. Therefore, if farmers adopt these practices in their cultivation then it can alleviate the need of cattle feed as well fodder during dry season. This management is also applicable in the normal season which is the conventional method for growing different yields in the same field. Once the farmers relied on this method and management, it could be both resistant of clime change and security of cattle feed and fodder of the livestock. By applying this indigenous knowledge farmer can grow main crops with a legume species in the same field and can get optional financial benefit form the main crops and legumes preserves for livestock feed.

Crop rotation: Now it is era of monoculture and all farmers are merely dependent on it in Bangladesh. However, monoculture is one of most significant reason for environmental degradation in the true sense. Scientifically, different plant species absorb nutrients from the different depth level of soil. Therefore, if farmers are repeatedly grow single crop such rice year after year in the same field then in the log run it causes demolition for both the cultivated land and crops. However, it is true that due to the monoculture, certain nutrients deficit in the soil as the same species of crops absorbed the same nutrients from the same depth of the soil. As a result there is a chance to raise the pest abundance then it requires more pesticides and fertilizers which caused infertility of soil as well as low production of crops. But if the farmers follow the crop rotation or intercropping system, it could keep both fertility of soil and satisfactory crop production. In this method farmers use to have harvest different crops within the certain gap and can not plant same species of crops repeatedly. In this gap farmers can easily grow variety of legumes for cattle feed and lots weeds also easy to manage during this gap from the filed. As a result soil can keeps certain fertility for specific crops and no need to use more pesticides as the abundance of pests reduced gradually for the intercropping system which is regarded as biological control. So as it does not require ample of pesticide and manures this system it turns environmental friendly where there is no effect of climate change and environmental degradation. Consequently, there is two benefits easy to get, one is huge cattle feed and fodder from the mixed crops and relief from pesticides that cause climate change and hazard.

Afforestation: The foremost and effective method to reduce the consequence of climate change and increase the abundance of cattle feed and fodder is afforestations. It can be varied due to the scope and landscape of the respective lands such as by community or rural forestry, farm forestry, agro-forestry, social forestry and homestead forestry. The government has the plenty of denuded land where different forestations are possible. Still we have the opportunity to use the denude land for managing different forestry's according the needs. To extend this management the related government offices, ministries, NGO's, livestock institute and agricultural extension division require making effective policy and concrete implementation. Here, to have effective afforestation, farmers and stakeholders need some motivations. The policy maker of Bangladesh need to find out why farmers are discouraged to apply agro-forestry in their crop lands by turns why they are unwilling to manage cattle feed from their agricultural farming why they are unable to incorporate indigenous knowledge in their livestock farming and agricultural practices. Researchers must know the lacking and need to emphasize the required steps to find the gap. We must bear in mind that no sustainable environmental management is possible unless increasing plantation and forestation. Furthermore, farmers easily can practice agro-forestry, social forestry, community forestry and homestead forestry with their main croups around the cultivated lands (There are lot lands across the river side, beside railway line, around ponds, haor, canals, estuaries, hills where enormous tree plantation is possible). The government should encourage the stakeholders to use the khas lands (belongs to government) for their forest

farming and it is come true then the integrated afforestation can help us to avoid the effect of negative climatic effects and enrich the cattle feed in the nature for sustainable livestock farming.

Biodiversity conservation: C3 plants, accounting for >95% of earth's plant species use rubisco to make a three-carbon compound as the first stable product of carbon fixation. C3 plants flourish in cool, wet and cloudy climates where light levels may be low because the metabolic pathway is more energy efficient and if water is plentiful, the stomata can stay open and let in more carbon dioxide. However, carbon losses through photorespiration are high (IFAD, 2010). Once it could be observed in the rural life that different livestock families such as cows, goats grazing in the field in one side and the other side domestic hens and cocks are finding insect and weeds for their feeding. Currently, this picture is unexpected as human are repeatedly causing damage of the biodiversity and environment. The natural resources (numerous weeds and specific plant leaves of jigni (local term), bamboo, mother (local term), jackfruit, alfaalfa, sugarcane and different legume species) in which the livestock live on are endangered due to unplanned extraction of natural resources. Now most of them are endangered species and rest of them are about to disappear due to the effect of climate change. The policy makers require taking proper steps for the surveillance of the extinct species to sustain them in the nature again for the wellbeing of the environmental balance and natural feed security of livestock farming. The different communities like government policy makers, NGO's, agricultural department require to build the awareness among the farmers so that they can understand the significance of the endogenous plant species for cattle feed and how it can help to keep the sustainable biodiversity of the environment. Even some aquatic plant species e.g., algae, phytoplankton, azolla also can be regenerated for livestock feed. Researchers should provide the knowledge to farmers for prospect of sustainable environment. Besides these, we should decide about the future plant species which can both effective for providing cattle feed and resilient the effect climate change. We should also train the farmers and stakeholders to grow and cultivate more C_4 plant species as the part of the entire biodiversity conservation and management.

Consumption of green fertilizer: In recent years it is established that the fertilizer plays a big role both directly and indirectly for the loss of biodiversity and environmental degradation. Most of the farmers and stakeholders are much more curious to use inorganic fertilizers rather than organic for their instant benefit. Although it seems that inorganic fertilizers lead to high productivity of the crops but in the long run measure it causes huge damage of livestock farming. The loss of biodiversity results in loss of weeds, grasses, legumes and other significant plant species which have extreme use as cattle feed and fodder for whole livestock. Now the question is what will be the scope for practicing green fertilizers in agriculture? We have the scope, each farmer and stakeholder; every livestock and each agricultural land are the sources of green manures. We should apply the indigenous knowledge for managing organic fertilizers. The farmers should store all the by-product livestock for a certain period which turns into organic manures. They also can keep cultivated fields having green parts of legumes after collecting yields which will be decomposed within certain period and turns into green manures. Besides there are lot of earth worms which can help making soil more fertile by their digestive system. Therefore, all scopes we have to apply but it requires some instrumental improvement, government policy and awareness of the different communities. Finally, it required the integration of agro-ecological and agro-livestock improvement for more consumption of green revolution for the wellbeing of the nature so that we can avoid the climatic hazards.

MANAGEMENT OPTION

Good and effective management system is very important as climate change related feeding is matters. As the study is to take the initiatives to find out the appropriate guideline following constraints and support gaps for livestock industry therefore, operational management plans and national policy frameworks must be place effectively to reduce the negative impacts. Here, some management option has been addressed by adopting the following approaches.

Integrated Agro-Livestock Management (IALM): There are lot of livestock and agricultural practices which the farmers try to apply for the sustainable livestock management. The main problem is that although these are very effective methods to overcome the adverse situation for resilience and cattle feed management but most of the time it seems ineffective. The examples are plenty in the case of Bangladesh. It is very apparent that if we are able to apply the knowledge of Integrated Agro-Livestock Management (IALM) both the ago-livestock sector will be benefited. The livestock will receive feed security from agriculture and the agriculture will get invaluable organic

and green manures from livestock. There are many aquatic species such as algae and duck weeds which can be utilized as the cattle feed frequently. Even there are some species of algae which can be use as the green manure in the agriculture to enhance the nutrients of soil rather depending on inorganic feed of the market. So, these seem very easy methods but question is to implement in the perspective of Bangladesh. The policy should not roundtable based discussion only but better to monitor the problems of the stakeholders why it is not sustainable and how can it get developed. The government policy makers should be cautious to bring an effective result. We must work with an integrated way to sort success. No doubt that we have the limitations of resources but it always it can not be the barriers. We people ourselves require to develop the management process for the sustainable cattle feed and livestock management.

Meet up adjustment: The cattle have a significant relationship with the variation of nature and it is more vulnerable to the climate change as its mobility and feeding system depend on it. Therefore, it is required to incorporate technical management process for the mitigation assess. We should keep in mind that the adjustment of the local communities to climate change sometimes relies on their socio-economic and ecological settings and on their accessible possessions. Cattle farmers have typically tailored to climate change and different environmental degradation by their indigenous knowledge. However, the growth of large inhabitants, unplanned urbanization, ecological humiliation as well as raised consumptions of livestock groceries has delivered most of the mitigation strategies abortive (Anower, 2008). Nevertheless, effective and reasonable adjustment measures required for the livestock keepers who are deprived to meet the expensive adjustment techniques and equipments. Therefore, some options can be incorporated such as by:

- Managing natural shadow, water and feed availability to shrink warm pressure from the raised warmth
- Take action on highly productive cattle
- Applying modern knowledge for livestock management

Improvement of science and technology: No doubt that still we are far behind from the application and utilization of developed knowledge and technology for livestock feed and to meet the impact of climate change on livestock management. Researchers should enrich the knowledge of new variety and heredity for livestock feed to resilient the effect of climate change. We should improve the gene bank (germplasm) for livestock study. Even, we can introduce the GM (Genetic Modified) species of different weeds, grass and other natural feed of livestock but all the knowledge of science and technology is very costly. Therefore, we must work on cost effective technological measure for climate change adaptation. However, it requires the support by the government and need initiatives by NGO's for achieving successful measures of the desired adaptations.

Changing strategies: The government of Bangladesh always priorities the agro-sector both in national budget but unfortunately livestock could not bring the successful outcomes. The policy makers and other communities require effective studying and planning for the result oriented methods rather than hypothesis. Nevertheless, it should be changed the management practices of livestock which can be incorporated such as by:

- Multiplication, escalation or incorporation of fodder administration, cattle and yield fabrication
- Preservation of environment and ecological unit
- Adjustment of accumulated navigation and space
- Require to establish integrated cattle farming scheme (stand-feed system and fodder forages)
- Build the awareness among the livestock keepers for developing their competence to global climate changes
- Effective training for agro-ecological expertise and silage development for their desired invention and preservation
- Intensification indigenous varieties which have the ability to adjust with the adverse conditions of climate change and lack of nutrition
- Adjustment procedures which are effortless to employ and price effectual for escalation facility of the livestock keepers to acclimatize to climate change

Collection of rapid developing varieties: Bangladesh need to develop the cattle competence by exchange energy commencing nutrition's into fabrication and thrashings from byproducts. Escalating nutrition's effectiveness and developing digestive system of livestock feed can be way of measures to shrink the release of greenhouse gas and enhance mass production and competence by reducing number of cattle. Most of the cattle keeping management such as heredity, inheritance, feed, nutritional complements and suitable forage system may lead into a sustainable feeding management. We much care about livestock grazing practices or feeding systems. Commencing pasture verities as well as legumes in the forage fields can be preserve more to reduce the adverse

effects. It has been found from a global study that grazing may have neither constructive nor pessimistic collision on grazing field's plantation resting on climate behaviors of forage land ecology, previous grazing planed and efficiency of administration. It is established that some of the grazing fields can enhance the biomass production by the random livestock grazing. However, it also can enrich the macrobiotic nutrients in the grazing lands. Besides few research studies found that the rotational grazing may have some collision on surface carbon reserves but have the advantages for cattle regeneration as well as vegetation. The forage policy may be changed by land carbon reserves by aggravating the stability between what the lands receive as input and what release from surface as output. Researchers must bear in mind that efficient cattle management scheme should accept suitable feeding methods and apply definite instrument and nutritional additives for having a sustainable food security for livestock.

DISCUSSION

The livestock contributes about 3% to GDP in Bangladesh national economy and ensures about 15% overall employments. However, unfortunately, this sector still far behind to receive the expected goals. Moreover, currently climate change related negative matters and suffering for feeds and fodders management restrict one step further to meet expected goal. Although, there is a national livestock development policy but it has poor implementations and the policies yet not to the standard to adapt with the climate change and to keep sustainable cattle feeds management in the way forward. Therefore, we feel that livestock industry requires a suitable framework for incorporating modern technology with the indigenous knowledge what we raised in the management option. The government of Bangladesh should consider to achieve livestock industry in a very effective way and government's appropriate attention should reflect on various strategies, policies and national plans. The Bangladesh government till now trying but failed to establish the certain percentage of grazing fields for the wellbeing of cattle feeds.

Therefore, together with government it also needs to involve the different communities to adapt with the climate change strategies for cattle feeds management as a way forward. However, financial incentives should be offered by government to the livestock keepers for their excellent performance for both managing cattle feeds and managing climate change adaptations. The policy makers should subsidize the livestock sectors but it should be introduced the climate change resistant livestock strains and grazing verities by modern technology. The livestock researchers of Bangladesh also require concentrating in developing the cattle feed rather than relying on market feeds and other related matters. Certainly, we have limitations in respect of resources but the government requires exchanging of research, innovations and technologies with developed countries so that we can learn how to protect the livestock and feeds and make it sustainable against the impacts of climate change. It is very apparent that mostly these impacts of climate change are responsible for deforestation, environmental degradations and unexpected human practices. Therefore, Bangladesh government should be involved in the desired reforms and actions in the implementation process what we addresses in the earlier sections. And finally, future policies should concentrate to build the awareness among the livestock farmers and rural people for the flexibility of climate change and strategies to mitigate the unfavorable conditions.

CONCLUSION

This study addresses the prospect and challenge of cattle feed in Bangladesh focusing on the concern of climate change and figure out the factors that are responsible behind to the lacking to overcome. This study notice that both climate change concern and livestock feed is very critical issue in Bangladesh. As a result, conservation of grazing lands, preservation of biodiversity, enhancement of the different forestry's and application of modern technologies and knowledge for breeding disaster resistant species may relief us from the livestock hazards and environmental degradation. Therefore, this study discussed the related issues and possible actions of strategies by the subject to current efforts, solutions of the problems, useful plans and achievements for the wellbeing of livestock industry. This study has also introduced an outlook for the sustainable livestock environment by following some potential options and emphasizes the effective plans and guidelines.

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