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Review Article

Need and scope for agroforestry in Disaster Management Plan for Animals.

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Abstract: Disaster causes threat to life and property. Management and mitigation measures have been primarily focused around human life. Technically, the post disaster management is centered on reviving the livelihood and often the poor and vulnerable sections of the society are affected much. Apart from agricultural farming, livestock rearing is major source of livelihood of farmers. With nearly 70% of the livestock owned by the marginal farmers, any disaster that cause a loss in livestock do affect these dependent people. Considering this reality, Government of India instituted "National Disaster Management Plan for Animals (DMP)". The entire DMP has been forged to provide guidance for the wellbeing of animals that got entangled in disaster in form of pre-disaster preparedness, disaster response and post disaster plan. In this context, ensuring adequate quantity of quality fodder and vital veterinary care assumes primary concern in post disaster response. In this context agroforestry, tree fodder assumes greater significance owing to their round-the-year availability and quality of fodder. There are many fodder based agroforestry systems that can withstands and maintain reasonable productivity even during extremes disaster situations like floods, drought and cyclones. A classical success model is the *Acacia leucophloea* and *Prosopis cineraria* based silvopastoral models for fodder production in arid and semi-arid regions and *ngitili* as a silvopastoral practice of Tanzania to evade the drought. Similarly, in flood condition trees are the only means for green fodder supply. Studies need to be initiated on the planning, implementation and management strategies to be followed for optimizing the productivity and quality of fodder through community involvement. Hence the information gap has to be suitability filled though proper research as well as extension through interdisciplinary approach. So that agroforestry based livestock management strategies can incorporated into DMP, so that not only protecting our precious livestock wealth and also to ensure the livelihood security of millions of marginal farmers. Agroforestry is potential approach for Disaster Risk Reduction (DRR) and help to mitigate the extremes of perceived disaster and incorporating agroforestry will a bottom to top approach.

Keywords: Disaster Management, agroforestry, management

Introduction

Disaster is a unique phenomenon whether manmade or natural there will be always a loss to life and property. It's also the situation where all life has to be treated equal whether it is rich or poor. When one comes in agreement about, each individual should introspect oneself whether they have considered the life of animals worthy. As for the real live situation goes there were steps taken to protect the animals, including livestock as well as pet animals in disaster times. For a being concurrent one should look into the number of animals that were rescued during Chennai floods or efforts taken by NGO's such as World Animal Protection that has been rescuing and taking care of animals that are affected across the globe from Mexico to Philippines (Thompson *et al.,* 2014; Anand and Ramachandra, 2016). The developed and developing nations are becoming aware of the importance of disaster management plan and are increasing their efforts in preparedness, response and recovery mechanism at various levels. One among such efforts is "National Disaster Management Plan for Animals" formulated by Government of India which gave priority to animals.

Outline of Disaster management plan

A good and detailed disaster management plan can avert the loss in property as well as lives of both humans and animals. Such Disaster plan will be off great significance in countries like India which are highly populated and diverse both in geographically and culturally further, more than 75 % of the states are prone to disaster in one form or another with 58.6 per cent of the landmass is prone to earthquakes of moderate to very high intensity; over 40 million hectares (12 per cent of land) is prone to floods and river erosion; of the 7,516 km long coastline, close to 5,700 km is prone to cyclones and tsunamis; 68 per cent of the cultivable area is vulnerable to drought and hilly areas are at risk from landslides and avalanches (NPDM, 2009).

During the last 30 years, the country has suffered over 400 major disasters **(**Ricketts, 2015**).** One should look in the economic impact of disaster

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which surmounts to one billion US dollars particularly the natural disaster losses accounts to 2 % of India's GDP which is 12 percent of central government's revenue. This can mitigated by a comprehensive Disaster Management Act, 2005 which insists creation of National Disaster Management Plan (NDMP) and the National Policy of Disaster Management, 2009 has made a paradigm shift from the disaster management to Disaster Risk Reduction (DRR).

Background – DMP of animals

Nearly 70% of the livestock is owned by the small, marginal farmers and landless people (Reddy *et al.*, 2012). It the poor and vulnerable sect of the society that gets affected much by disasters with a long-term impact on their livelihoods (Table 1.). Including animals in disaster management plans is secure and economical long-term investment (Otte *et al.*, 2012). A cost benefit study carried out in India following the Assam floods long-term response (2012-2013) showed a US$96 benefit for every $1 spent. In Indian context, animals represent cultural livelihoods, cultural identity and companionship apart from being source of livelihood. Similarly, pets provide physiological and emotional support many people in urban areas. So there is a greater need and significance for the formulation such management plan were animals are protected.

Table 1. Impact of Disasters in quantitative terms during 2001-2014 in India

Year	Lives Lost (Numbers)	Cattle Lost (Numbers)	Houses damaged (Numbers)	Cropped area affected (Rupees in lakh)
2001-02	834	21,269	3,46,878	18.72
2002-03	898	3,729	4,62,700	21.00
2003-04	1,992	25,393	6,82,209	31.98
2004-05	1,995	12,389	16,03,300	32.53
2005-06	2,698	1,10,997	21,20,012	35.52
2006-07	2,402	4,55,619	19,34,680	70.87
2007-08	3,764	1,19,218	35,27,041	85.13
2008-09	3,405	53,833	16,46,905	35.56
2009-10	1,677	1,28,452	13,59,726	47.13
2010-11	2,310	48,778	13,38,619	46.25
2011-12	1,600	9,126	8,76,168	18.87
2012-13	984	24,360	6,71,761	15.34
2013-14	5,677	1,02,998	12,10,227	63.74

Source: DMP,2016

Chronicles of DMP of Animals

Government of India acknowledged the importance of animals, thereby it included a clause pertaining to protection of animals during disaster both in National Livestock Policy (2013), National Disaster Management Act (DM Act, 2005) and the National Policy on Disaster Management which states, "*It is necessary to devise appropriate measures to protect animals and find means to shelter and feed them during disasters and their aftermath, through a community effort, to the extent possible. The Departments/Ministries of the Government of India …… and the States concerned should devise such measures at all levels"* (NPDM, 2009).

The National Livestock policy to mentions about the "Contingency plans will be prepared to maintain the productivity and welfare of livestock and poultry sector during various types of natural calamities and drought conditions. The primary aim will be of making fodder availability and providing veterinary care.

The NDMA (National Disaster Management Authority) which was established as per DM act, 2005 issued as directive to all states and UTs' to prepare disaster response plan (DRP) with details regarding protection of animals during disaster in 2013. Bihar and Sikkim were two states that obliged the directive and prepared state level DRP integrating animal protection. Bihar has even gone extensive awareness creation among the folks specially to mitigate the drought. All these efforts are part of India's obligation toward UN's effort to reduce the impact of disaster through conferences and framework such as Hyogo Framework for Action (2005-2015) that was succeeded Sendai Framework for Disaster Risk Reduction (2015-2030). The concept of risk reduction got initiated with Hyogo Framework for Action that aimed at building the resilience of Nations and Communities (Srinivas and Nakagawa, 2008). While the latter has broader view by insisting the signatory to create DMP plan for Animals. Coast Rica was one of the pioneer to have its own country DMP for animals. Other countries such as Australia, New Zealand have their own DMP plans too.

Formulation and Structure

The plan was prepared by consulting many stake holders such as NDMA (National Disaster Management Authority), NDRF (National Disaster Response Force), NIDM (National Institute of Disaster Management) along with Department of Animal Husbandry, Dairying and Fisheries (DAHDF) (under the Ministry of Agriculture, GoI). The entire plan has been formulated in such a forge that it provides guidance to all related agencies of the steps to be taken in the present, past and future wellbeing of animals that has got entangled in any disaster as 1. Pre-disaster preparedness 2. Disaster response 3. Post disaster plan. The pre-disaster preparedness comprises of identification and early warning, vulnerability assessment, feed and vaccination arrangement plus capacity building in different levels of stakeholders. The disaster response mainly deals with rescue and prevention of epidemics and finally the post disaster response includes treatment of diseased and injured individuals, restoration and restocking livestock. (DMP, 2016).

Based in National DMP the State Specific Disaster Management Plans has to be prepared by the respective State Governments. DAHDF will constitute an Animal DM Advisory Committee at national level and animal husbandry departments in

States/UTs' will take at state level. A dedicated DM cell will be managing, reviewing and carry out the revision on the DMP. The funds for the program will provided by the Ministry of Finance by earmarking 10% of funds of centrally sponsored release as 'Flexi Fund', part of which may be utilized for disaster mitigation or for restoration works activities on State specific needs. The DMP has special detailing on feeding norms during disaster, procedure for disposal of dead carcass, Estrus synchronization pre- vaccination.

Agroforestry a tool against disaster

Ensuring adequate quantity of quality fodder and vital veterinary care assumes primary concern in post disaster response. In this context agroforestry, tree fodder assumes greater significance owing to their round-the-year availability and quality of fodder. There are many fodder based agroforestry systems developed for diverse agro-climatic regions of the country. However, systems that can withstands and maintain reasonable productivity even during extremes disaster situations like floods, drought and cyclones are yet to be evolved for different disaster-prone regions of the country. A classical success model is the *Acacia leucophloea* and *Prosopis cineraria* based silvopastoral models for fodder production in arid and semi-arid regions and *ngitili* as a silvopastoral practice of Tanzania to evade the drought. Similarly, in flood condition trees are the only means for green fodder supply. The recommendation provided by the DMP for Animals is quite vague yet, it can be further enriched by the incorporating the technological inputs obtained from the Silvopastoral research carried throughout the country.

Recommendations of DMP and Interventions from agroforestry perspective

The DMP provides recommendations to face the fodder demand in both pre-disaster phase and disaster response phase.

Pre-Disaster phase:

Actions recommended in DMP	Possible agroforestry intervention
Increase availability of fodder based on latest knowledge and technical knowhow	Vast scientific information of Silvopastoral systems can be done
Prepare list of fodder grasses, legumes, shrubs and trees for different agro-ecological basis	Further research in technically quantifying the nutritive value as well as exploring other tree fodder and their potential to be combined in agroforestry
Supply of quality planting material and technical inputs	An interdisciplinary extension programme has to be framed
Make appropriate intervention such that fodder is available at ground level	Agroforestry is the best tool as it can make sure of round the year fodder availability as well as its nature to reach the marginal farmers

Disaster response phase

Actions recommended in DMP	Possible agroforestry intervention
Much focus has been on the different feeding technologies including Urea treatment of straw Urea treated molasses liquid diet (UMMB) Compressed complete feed block (CCFB) Usage of Sugarcane crop residue as animal feed Tree leaves and vegetable leaves Trees listed: Neem, mango, pipal, babul, subabul, mahuva	It can rightly assumed that the potential of tree based fodder has not been fully understood. The list tree species included in the DMP are also very few where potential tree fodder has been greatly neglected.

Prominent tree species

Many works on the yield, nutritive value, palatability and many fodder criteria such as *In vitro* dry matter digestibility, mineral matter, etc. have been studied.

Table 2. Dry matter (%) and crude protein (%) content of tree fodder in comparison with recommendation of fodder source from DMP (Source: Weixian, 1995; Amanullah *et al.*, 2006; Maselli *et al.*, 2011)

S.No.	Fodder	Dry matter (%)	Crude protein (%)
1	Straw	89.0	3.4
2	Ammonia treated straw	88.0	12.9
3	Urea treated straw	51.0	9.9
4	Cotton oil seed cake	-	29.5
5	*Melia azedarch*	21.7	12.8
6	*Grewia oppositifolia*	27.3	19.9
7	*Acacia nilotica*	22.7	18.1
8	*Morus alba*	26.5	14.8
9	*Salix tertrasperma*	24.38	17.4
10	*Acacia tortolis*	30.2	19.2
11	*Albizia lebbeck*	31.2	19.8
12	*Acacia leucophloea*	31.2	15.1
13	*Albizia amara*	36.7	16.6
14	*Azadirahcta indica*	27.1	14.6
15	*Delonix elata*	31.5	13.2
16	*Erythrina indica*	27.7	19.5
17	*Gliricidia sepium*	27.5	22.0
18	*Morinda citrifolia*	26.8	11.1

This nutritive value of the tree fodder is far better than that of urea treated straw or other recommendation of the DMP (Table 2.). Apart from on par nutritive content, the tree fodder also possess better mineral content that can increase the growth and yield of the ruminants. Lefroy *et al.* (1992) based on his work gives us the factor important for assessing the forage value. They are 1. Forage value for animal 2. Economic value to the landholder and 3. Landscape value to the farm. Based on the above criteria one will be surely appreciate that the tree based fodder are better.

Conventionally the tree based fodder has been used farmer and herders. However, there are recent studies showing that a mixture of tree fodder with concentrate feed can reduce the level of consumption of concentrate feed which ultimately reduce the cost of production to greater extent. Veterinary institutes have been recommending tree fodder for low-input livestock production but not

practiced by farmers. Agroforestry can be better way for recommending the use tree based fodder that can be used even in disaster time too.

Future work ground

Assessing the supplementary values of tree fodder and framing suitable agroforestry combinations. To develop simple techniques for improving palatability of tree fodder and preservation techniques for tree fodder quality. Finally give field level, tree fodder based cost-effective feed formulations for farmers which needs interdisciplinary research.

Conclusion

Nonetheless, there is genuine lack of information on the tree species suitable for thriving various disaster regimes as well as storing excess tree fodder to evade the extreme situation in form of silos and bunker. Studies need to be initiated on the planning, implementation and management strategies to be followed for optimizing the productivity and quality of fodder through community involvement. Hence the information gap has to be suitability filled though proper research as well as extension through interdisciplinary approach. So that agroforestry based livestock management strategies can incorporated into DMP, so that not only protecting our precious livestock wealth and also to ensure the livelihood security of millions of marginal farmers. Agroforestry is potential approach for Disaster Risk Reduction (DRR) and help to mitigate the extremes of perceived disaster and incorporating agroforestry will a bottom to top approach.

Author's declaration

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