

Strategies of livestock management during flood

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Flood is the overflow of area that are not normally submerged with water or a stream that has broken its normal confines or has accumulated due to lack of drainage. During flood disaster human life as well as animal life can be saved by efficient planning and effective execution, well preparedness and controlled management during and after the flood. Among all the natural disasters afflicting the country frequently, river floods are the most devastating, which cause maximum damages of life and property in India.

Key words: Flood, Livestock management, Water borne diseases

ACCORDING to Rashtriya Barh Ayog (1980), India's total geographical area of 329 million ha, about 40 million ha is prone to floods, out of which 32 million ha has been considered as protectable area. In our country, flood prone states are Bihar, West Bengal, Odisha, Assam and Andhra Pradesh in which river flood is a seasonal phenomenon occurring in concordance with the monsoon. Joint training between veterinary emergency response care and humanitarian relief workers will enhance the ability of both communities to work together and ensure an approach to disaster management that save both people and animals at the least cost. Policy makers should take into account practical indigenous techniques and economic, trade or social restrictions for disaster management. Mitigation, preparedness, response and recovery are the strategies which can be taken up in order to minimize the loss of livestock due to flood.

Mitigation

It is defined as any actions taken to prevent an emergency and reduce the long-term risk to life and property from disaster (Fig. 1). Constructing animal shade on high

ground area, immunization of animals, creating a list of emergency telephone numbers of neighbours, local veterinarian and members of NGO trained in disaster etc. are some of the mitigation steps.

Preparedness

Strategies of flood disaster preparedness includes developing plans for what to do, where to go and whom to call for help before flood occurs. This enhances the chances of success in dealing with an emergency. Disaster preparedness is

particularly important for livestock because of the animals size and their shelter and transportation needs.

Evacuation

Evacuation of the animals from the flood prone area to a safer places is one of the best measures. Rescue and rehabilitation of livestock with the help of specially designed and motor operated large size boats on uplands, roads and river embankments. Animals should set free from binding rope if information of flood is received to prevent drowning.



Fig. 1. Migration of animals during flood

Feeding

Feeding of livestock is major challenge faced by the farmers of flood affected areas because grazing areas remain submerged with water. During the period of flood as there is no place for grazing of animals and standing forage are damaged due to flood water. Alternative feeds like Peepal, Neem, Jute leaves, Bargad, Shesham, Subabool, Mahua, Jamaun plants, Bamboo leaves, Water hyacinth etc. can be used to save livestock life during flood period. These fodders can be fed to animals along with Bhusa/Paddy straw. Provision for storage of fodder and feed block in upland area of the flood prone districts to provide the feed support during scarcity must be assured. Establishment of Fodder Banks at least one at Block and Panchayat level for storage of dry and green fodders in hay and silage forms respectively in order to make available for feeding of the farmers animals during flood. Maize and Jowar are important crops which can be easily ensiled to get qualitative silage. Fodder can also be preserved in the form of hay. The primary objective of hay making is to reduce the water content of green plant upto the level of 15%, so that they can be safely stored without undergoing fermentation. Berseem, Lucerne and Cowpea are most preferred leguminous crops for hay making which has the characteristic of higher percentage of plantation of fast growing trees like Poplar on both sides of roads as well as river embankments to meet out fodder requirements during flood situation. This will provide shelter for the men, animals and birds as protection from soil erosion of the roads and embankments from the flood water. Priority to animals should be in requirement during flood situation: suckling animals, producing/working animals, sick/old animals, adult non producing animals. List of plants with their fodder quality which can be fed to flood livestock at limited extent are given in Table 1.

During and after flood, urea treated straws, urea-molasses mineral block and complete feed blocks can be prepared and stored in fodder

Table 1. Plants feed for flood affected livestock

Plants	Botanical name	Plant part used as feed	Digestible protein (%)	Total digestible nutrient (%)
Bamboo	<i>Dendrocalamus strictus</i>	Leaves	9.3	49
Jute	<i>Corchorus olitorius</i>	Leaves	14	60
Neem	<i>Azadirachta indica</i>	Seed & leaves	18.3	53
Bargad	<i>Ficus bengalensis</i>	leaves	1.99	-
Peepal	<i>Ficus religiosa</i>	leaves	7.3	40
Subabool	<i>Lecucaina leucocephala</i>	Leaves	12.5	51.5
Shesham	<i>Dalbergia latifolia</i>	leaves	9.07	52

bank to ensure the nutritional requirement and save the life of livestock.

Urea treatment of straws

For the preparation of urea treated straws, four (04) kg urea is dissolved in 50-60 liters of water and then it sprinkled on 100 kg wheat straw/ bhusa, mixed thoroughly and packed in plastic sheet air tightly. This nitrogen enrichment feeds are ready for feeding after 3 weeks. It can be fed to animals by incorporating in animal diet gradually.

Urea-molasses mineral block lick

It is a compact supplement used for feeding with poor quality dry roughages. This contains molasses (25%), wheat bran (30%), deoiled rice bran (30%), urea (10%), Mineral mixture (2%), calcite powder (1%) and Sodium bentonite (1%). Adequate amount of water can be added to make hard paste for moulding in shape of bricks and blocks. This block lick save animal life with low cost and simple method of feeding and can be easily distributed among livestock farmers during flood period.

Complete Feed Blocks

It is an economical feed because it composed of easily available crop residues and low cost agro-industrial by-products. Wheat straw, deoiled ground nut cake, rice polish, potato, sweet potato may be used for the preparation of complete feed block. The complete feed blocks can be used during flood situations due to easy transport and it requires one third space as compared to mash form.

Air dropping of Urea-molasses mineral block licks and Complete Feed Blocks in flood affected areas

will save the life of animals during flood time. The animals are under stress due to heavy rains or insufficient fodder during rains, hence it is advised to add minerals and vitamins in feed.

Water management

Animals can survive for many days without feed but cannot survive for more than 3-4 days without water. Therefore, water management is essential part for survival of animals. Chlorinated, clean and safe water must be provided to livestock. Lactating and pregnant animals should be given priority over non-productive animals.

Diseases to be cautious during and after flood

Flooding has a wide range of animal health consequences such as drowning, injury, outbreak of gastroenteritis, respiratory infections, poisoning, communicable diseases, epidemic of water-borne and vector-borne animal diseases.

The main cause of water-borne diseases during flood is the contamination of water. Floods transport bacteria, parasites, and viruses into the clean drinking water system thus leading to an outbreak of water borne diseases. Leptospirosis one of the important water borne zoonotic disease caused by *Leptospira* species. It is a bacterial disease that can be transmitted by direct contact with contaminated water. Logging of water during flood, forces rodents from their burrows into built environment and closer to human-animal population, thus increasing the risk of infectious rodent-borne disease outbreak such as leptospirosis. Rodents shed large amounts of *Leptospira* in their urine, and

transmission occurs through contact of the skin and mucous membranes with water, damp soil or vegetation (such as sugar cane and paddy), or mud contaminated with rodent urine. The possibility of infection in animals and humans is increased due to excessive flow of water during flood. The affected animals show symptoms of fever, jaundice, haemoglobinuria, abortion and nephritis. Several isolates of *Vibrio cholerae* (cholera), *Salmonella enterica* serotype Paratyphi A (paratyphoid fever) and enterotoxigenic *Escherichia coli* had been also reported during outbreak of diarrhoeal disease after flood.

Incidences of vector-borne infections are higher with increase in the rainfall amount. Often, the reproduction, development and population dynamics of arthropod vectors (especially mosquito), their pathogens, and non-human vertebrate reservoirs are known to be badly affected by changes in precipitation and water logging conditions. For example, flood provides new breeding grounds for mosquitoes, and this leads to an increase in the number of mosquito-borne diseases such as Rift Valley fever, Malaria and West Nile fever. Flood provides ideal breeding conditions for *Anopheles* mosquitoes (Malaria vectors). Sometimes, it leads to tremendous increase in the vector population leading to an explosive epidemic of Malaria. Rift Valley fever (RVF) is another mosquito-borne disease which is closely linked to periods of heavy rains and flooding. It provides a favourable environment for the hatching of the primary vectors and reservoir of mosquitoes known as flood water *Aedes*, which is

primary cause of RVF that induce the disease outbreak. The infected *Aedes* mosquito eggs from the flood water hatches in the persisting stagnant water and matures into infective adult mosquitoes. RVF is a severe fever causing viral disease most commonly observed in domesticated animals (such as cattle, buffalo, sheep, goats, and camels), with the ability to contaminate and trigger illness among human beings. Increased mosquito and midge population after high rain fall often result in outbreak of Three-day sickness (bovine ephemeral fever) and Akabane disease which are another vector-transmitted disease in cattle. Such diseases make them feverish, anorectic, weakened, debilitated and finally unproductive. Equine infectious anaemia is a vector-disease affecting horses that can significantly increase after flooding.

Anthrax is a serious zoonotic disease affecting domestic animals especially ruminants (such as goats, cattle, sheep, and horses) and peoples during flood. It is caused by the soil-borne, Gram-positive, spore-forming organism *Bacillus anthracis*. A number of abiotic and biotic vectors such as insects (biting flies, blowflies, mosquitoes and ticks), scavengers, soil and water have also been implicated in the dissemination of anthrax. A non-biting blowfly (*Chrysomya albiceps*) play immense role in disseminating *B. anthracis* onto the surrounding vegetation in flood affected area. Sudden death (often within 2 to 3 hours of being apparently normal) is by far the most common sign of anthrax. However, very occasionally some animals may show trembling, a high temperature,

difficulty breathing, collapse and convulsions before death. After death blood may not clot, resulting in a small amount of bloody discharge from the nose, mouth and other openings.

The immediate issues for livestock during and following floods often relate to significant impacts on livestock which arises from various infectious disease other than mentioned above like-Clostridial (mainly black leg) and Botulism (a progressive paralysis) from the ingestion of a toxin found in rotting animal material or on the bones of dead animals. Prolonged wetness of wool can also lead to skin infections, the most common of which is lumpy wool in sheep. Wetting of the feet of livestock for extended periods or injury to the foot can allow the entry of bacteria and foreign matter resulting into development of foot abscess and foot rot. Many-a-times flooding is found to be a possible cause of Foot and Mouth disease outbreak among cattle. Therefore, it becomes essential to identify and treat foot problems immediately. Prolonged wet and hot weather produced in post-flood period, predisposes the cattle and buffalo population for the outbreak risk of Hemorrhagic septicemia (HS) disease in flooded areas. Therefore, it is imperative to follow the better vaccination strategies of animals especially living in flood areas to combat the outbreak of infectious disease.

Mass vaccination

Vaccination of susceptible animals against infectious disease is a well-established strategy for helping to

Table 2. Infections diseases and its vaccination

Name of disease	Causative organism	Symptoms	Vaccination
Haemorrhagic septicaemia (HS)	<i>Pasteurella multocida</i>	High fever, increased respiration, salivation, inflammatory swelling in the head and neck region and protrude tongue in per acute form	Primary vaccination is done at 6 months of age and above followed by annual vaccination in the month of May-June
Black Quarter(BQ)	<i>Clostridium chauvoei</i>	Disease confined to young calves between the age of 6 months and 2 years. High fever, oedematous and crepitating swellings develop in the hip, shoulder chest, back and neck	Primary vaccination is done at 6 months of age and above followed by annual vaccination in the month of May-June
Foot and Mouth Disease (FMD)			Primary vaccination is recommended at 4 months of age and then subsequent biannually vaccination are done in the months of February and August

combat the outbreak of disease following flood. Immunization programs should be done before the monsoon season in order to prevent the infectious diseases that flood waters may spread. Immunization provides moderate protection against the disease. Animal owners should be advised to get their animals vaccinated against the prevalent diseases before the onset of monsoon i.e. May-June. When large numbers of animals are assembled, one should watch for any indication of infectious diseases such as pneumonia, foot-rot, Leptospirosis (Table 2). These diseases are more likely to occur where cattle are crowded on wet ground and where horn flies and houseflies are abundant and it should be promptly reported to a local veterinarian.

Parasitic infections in animals and their prevention during flood

Deworming: After a flood, animals can be particularly susceptible to certain types of parasites. Trematode worms infection like Liver fluke, amphistomes etc. may be picked up by the animals during flood period because intermediate host of all trematodal worms is snail. Snails population increases during flood time. Hence, animal owners should be advised to drench the Oxyclozanide anthelmintic before the onset of monsoon i.e. May-June month with the consultancy of veterinarian. There may also be an increase in worm infestation in immediate post-flood period due to the moist conditions.

Emergency drugs - Keep some drugs like Antidiarrhoeal (Cefox-TZ, Neblon powder, etc.) Antiseptic lotion (Betadine, Himax cream, Topicure spray etc.), Anthelmintics (Fasinex, Distodin, Anthomaline, etc.), Antibiotics (Sulphadruugs, Penicillin, Oxyteracycline, etc.), Analgesic, Liver tonics, Avil, etc., for emergency situation during flood.

Strategies for carcass disposal - Carcass disposal possess an acute problem in disaster like flood where the number of animals dying would be enormous. Decaying/rotten carcasses (a heaven for pathogens) and outbreak of infectious diseases

Table 3. Worm infections and its preventions

Name of the worms	Symptoms	Chemo-prophylactic/ Therapeutic drug
Amphistomes (Stomach fluke)	Fluid foetid diarrhoea (Shooting diarrhoea), submandibular oedema (bottle jaw), animal becomes thirsty and drink frequently	Oxyclozanide @ 10mg/kg body weight orally
<i>Fasciola</i> sp. (Liver fluke)	Anaemia (more than 0.5 ml blood/ fluke/ day lost) and hypoalbuminaemia, hyperplastic cholangitis in the bile duct, Submanibular oedema (bottle jaw) and constipation followed by diarrhoea in later stages.	Triclabendazole @10 mg/ kg body weight orally
<i>Schistosoma nasale</i>	Rhinitis, mucopurulent discharge, snoring, and Cauliflower like growth in the nasal mucosa	Lithium antimony thiomaleate @ 15 ml i/m or Oxyclozanadie @ 10 mg/kg body weight orally thrice at weekly interval or Praziquantal

becomes threat to health security of both human and animals. Therefore, disposal of carcass as per the appropriate methods is necessary for ensuring proper sanitation to avoid outbreaks of epidemics. Burial is preferred disposal method in flood affected area because it is a quicker, cheaper, environmentally cleaner, easiest to organize and most convenient for disposal of large numbers of livestock (Fig. 2). Access to burial site (at least 100 m from wells/ streams/ponds, etc.), safety to personnel, height of water table, trench depth (at least 1.5 m above the seasonal high-water table), distance from residence (at least 100 m away),

distance from stream/wells and bio-security consideration are some important consideration for proper carcass disposal. Carcasses cannot be placed in any body of water, seasonal creek or pond, or in areas that may carry or hold water. Layers of lime or quicklime powder and salt should be applied below and above the carcass to hasten the activation of carcass decomposition. Burial pits must be covered with a minimum of 2-3 feet of compact soil. Fences may need to be erected around the burial site. Land requirements to burry and entire herd as per the guidelines are-A pit 2 m (6.5 ft) wide × 4 m (13 ft) depth × 10 m (33 ft) long which can



Fig. 2. Deep burial method of Carcass disposal

hold 31 adult cattle carcasses with 6.5 ft soil cover. During flood where no land for burial is available, surface burning method can be used with jute sack and petrol or kerosene. Otherwise, carcass may be covered with lime and salt and finally buried when water recedes. Care should be used in applying lime as it is caustic and can cause severe burns to the skin and eyes. The handling of bodies by relief workers does of course require protecting clothing. Although it is not possible to follow all the guidelines strictly in places where there are many casualties yet a sincere effort may change the scenario. During preparedness of disaster like flood, training of community members, mobilizing community participation for carcass disposal and training of volunteers and creation of local units for carcass disposal must be done

Training and broadcasting about flood

Farmers of the flood prone areas should be given training about how to save the animals and itself during flood situation. There should proper planning and depute some trained veterinary personnel, National Government organisations (NGOs) in the flood prone areas before the onset of monsoon so that they can evacuate the animals in minimum period of time during sudden onset of flood. Information of flood and how to save their animals should be broadcasted regularly on televisions, radio, newspapers, leaflets, etc.

SUMMARY

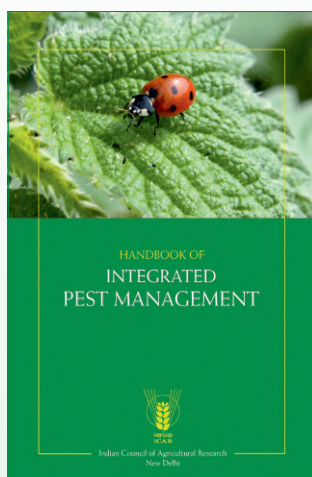
During flood disaster human life as well as animal life can be saved by efficient planning and cautious execution, well preparedness in advance and wise management during and after the flood. The losses

due to flood disaster can be minimised by awareness and proper training of farmers, establishment of fodder bank at least up to block level, periodical vaccination and deworming of animals, information of flood and how to safeguard their animals should be broadcasted regularly on televisions, radio and also through newspapers, leaflets etc. Proper planning as well as co-ordination among NGOs, trained veterinary personnel and others who can provide emergency Veterinary services so that Veterinary aid can be reached in flood affected areas within minimum period of time.

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HANDBOOK OF INTEGRATED PEST MANAGEMENT

To reverse the loss of environmental resources and also to reduce biodiversity loss, the Government of India has Integrated Pest Management (IPM) as part of the National Agricultural Policy. Integrated Pest Management emphasizes the growth of a health crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms. IPM is not new – mechanical, cultural and biological tactics were used by farmers for hundreds of years before chemical pesticides became available. Besides, there are IPM techniques that have been developed more recently and are effective in suppressing pests without adversely affecting the environment.



The task of spreading the message of IPM across is tough due to poor awareness about the subject among people in line-departments as also among the farmers. The information on integrated pest management as a whole is scattered. This *Handbook* comprehensively deals with all the aspects of integrated pest management in field crops, horticultural crops under traditional, protected systems. Information on basic strategies and tactics of different methods of management including mass production of biocontrol agents, IPM policy and pesticide registration is provided in comprehensive form.

The *Handbook of Integrated Pest Management* comprises 82 chapters which are well written in lucid language with crispy sentences by the renowned scientists. The role of IPM is elucidated with different pests like *Trichogramma*, *Bacillus thuringiensis*, *Nomuraea rileyi* etc. and agricultural crops like rice, wheat, maize, sorghum, pearl

millet, pulses, soybean, rapeseed mustard, groundnut, minor-oilseed crops, sugarcane, cotton, jute and mesta, potato, vegetable crops, fruits, grapes, citrus, banana, pomegranate, coconut etc. This *Handbook* will provide information of available useful technologies to educate on how to reduce or judiciously use chemical pesticides, safeguard ourselves from chronic poisoning, save the National environment while also reducing input costs and raise farmers' income. This compilation will be useful to teachers, students, trainers, line-department personnel and policy makers.

TECHNICAL SPECIFICATIONS

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