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Tarım İşletmelerinde Afet Yönetimi Ve Hayvan Besleme Risklerinin Azaltılması

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Özet

Sürdürülebilir tarımsal kalkınmayı sağlamak, açlığı hafifletmek, afet yönetiminin kapsamlı ve tüm riskleri içine alan planlamalarını yapabilmek için tarım sektörü ve çiftçilerin dahil olduğu afet müdahale planları ile birlikte sektörün tüm paydaşlarını kapsayan eğitim ve yayım çalışmalarının artırılması önemli bir husustur. Bu çalışmada, doğal afetlerin tarım üzerindeki etkileri, gelecekteki iklim değişikliğine adaptasyonun sağlanabilmesi ve özellikle çiftlik hayvanları için besleme ile ilgili riskler hakkında kapsamlı bir afet yönetimi için mevcut göstergeler değerlendirilmiştir.

Anahtar kelimeler: Afet, risk, agro terörizm, yem güvenliği

Disaster Management at Agricultural Enterprises and Reduction of Animal Feeding Risks

Abstract

It is of great importance to promote education and informative publications involving all shareholders of the sector along with Disaster Response Plans which cover the agricultural sector and farmers in order to draw up the planning inclusive of all risks and a comprehensive disaster management, to reduce hunger and to maintain sustainable agricultural development. In this study, guidelines are drawn up for a comprehensive disaster management in terms of the risks as to how to feed farm animals, the effects of natural disasters on agriculture and how to adapt to a climate change in the future.

Key words: Disaster, risk, agroterrorism, feed safety

1. Introduction

Because agriculture depends, to a large extent, on air, climate, soil and water, it is defenseless particularly against natural disasters. Natural disasters lead to a reduction in agricultural output, having a direct effect on it. They also indirectly affect the agricultural development, rural subsistence and gradually all agricultural activities, thus the economy of the country. Beyond the short-term destructive effects caused by natural disasters, they also give rise to such long- lasting and multiple consequences as the loss of productivity in animal and plant production, epidemics

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and damage to rural infrastructure and irrigation systems. Leading to destruction in agriculture and in sources of subsistence, natural disasters could bring about a cost of million dollars, distrust in food and wide-scale damage. The food chain is constantly under threat due to the worrying increase in epidemics and in the number of animal and plant pests which have the potential to spread across borders. The extreme weather conditions caused by climate change, the fluctuations in the market, pests and diseases are the risk factors that adversely affect this vulnerable sector. Reducing the risk of a disaster and managing it has therefore become an integral part of modern agriculture [1].

The Sendai framework, which focuses not only on reducing disaster risks but also on losses from disasters and which is built on the Hyogo Framework Action Plan, aims to prevent new risks, to reduce existing risks and to increase resistance to disasters. At this point, the Sendai framework paves the way for these risks to be understood so that national and international mechanisms of cooperation can be fortified. In 2017, the Global Platform for Reducing Disaster Risks and COP23 brought international authorities together, and they reiterated their commitment to reaching global targets of the Paris convention and the Sendai framework for reducing disaster risks (Figure, 1). In this commitment, the need for planning, preparing, reducing the damage, intervention and improving the situation was stressed in increasing resistance to the effects of disasters on most small-scale agricultural farms with the contribution of FAO to adhering to a unified global indicator as regards agricultural and economical losses caused by disasters [1]. The latest data related to the effects of disasters and crises on agricultural sectors revealed that further studies are required as regards the risks posed by forestry, fish farming and aqua farming as well as by animal and plant production, although these data reveal how the whole sector is affected (Figure, 2).

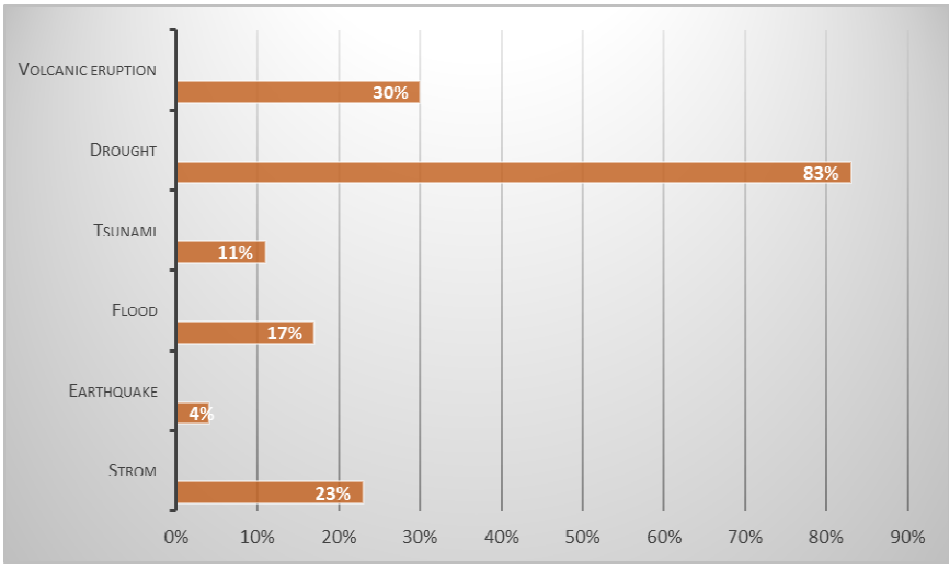

Figure 1. Damage and loss in agriculture as share of total damage and loss across all sectors (2006–2016), by type of hazard, (Fao, 2017)

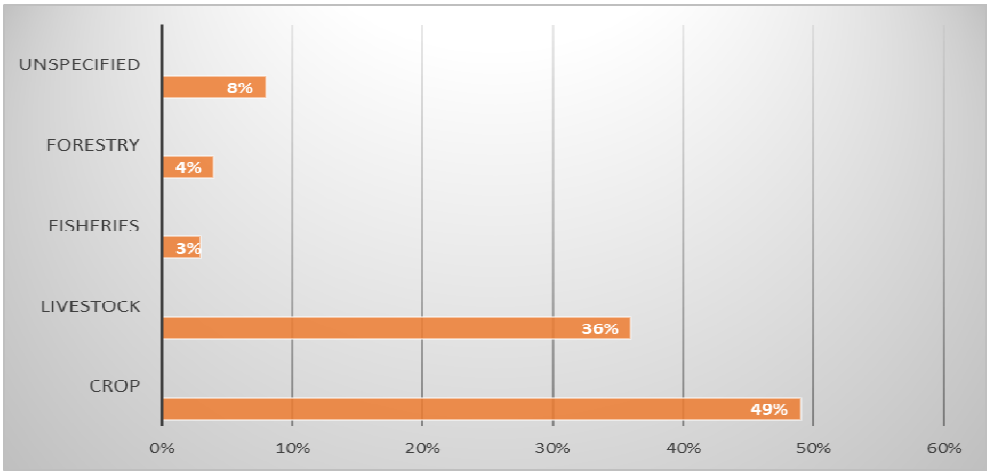

Figure 2. Tarım sektörüne ait toplam zarar ve kayıpların alt sektör grubuna göre 2006-2016 yılları arasında dağılım yüzdeleri (FAO, 2017)

Partnerships are essential to increase the efficiency of disaster risk management. Universities, public institutions, international research agencies, civil society and private sector have the opportunity and responsibility to cooperate for the commitment of a more secure future for agricultural and rural sources of subsistence. Two main points of great importance are regular record-keeping by agricultural corporations in order to monitor and evaluate disaster risks and to create resistance in the agricultural sector against natural disasters in order to promote an efficient policy and activity of reducing disaster risk. It's also important to record the incidents at every stage of a disaster in order to make an evaluation possible following the disaster. Keeping a systematic record of the incidents will maximize the benefits to be obtained from the past experience, help determine the most likely recuperation needs, laying the foundation of the following emergency plans. Both national and local capacities should be reinforced to deal with increasing risks and recurring shocks. Creating an agricultural sector resistant to disasters through more holistic and comprehensive planning is of vital importance to maintain sustainable development. Protecting agriculture and consumers will reduce the possible damage to the food chain of humans. Collecting all the data required on a national scale, reducing the threats and risks for agricultural yield, protecting public health and ensuring the prosperity of the country are essential steps in this process. It is also essential to facilitate cooperation between shareholders. The role of agriculture in disaster management, which is developed on a national and international scale, is really important because of its large interaction with the environment, its direct dependence on natural resources for production and its significant role in socio-economic development. Because it is seen when drawing up strategies to reduce disaster risks that the sections which are affected most by disasters are poor countries and rural areas, the maximization of the resistance in the agricultural sector, particularly in developing countries, requires the implementation of planning which would provide opportunities to eliminate the cycle of poverty in order to minimize the destructive effects of disasters on sources of subsistence and economy.

Although a large number of people have emigrated from rural to urban areas in our country, 35% of the population still lives in the countryside [2]. 22% of the total damage and losses caused by natural disasters has occurred in agriculture in developing countries [3].

2. The role of Animal productivity in disaster management

Livestock-raising plays an important part in the subsistence of a large majority of the population, particularly in developing countries. Farmers increase the number of their animals when farms are profitable and they sell their animals in risky periods to obtain cash. Worldwide animal productivity accounts for 40% of the total value of agricultural production (FAO, 2000) and this percentage is likely to increase since the demand for animal products is increasing as a result of the increase in prosperity and urbanization. Livestock-raising provides a stable contribution to family income in arid and semi-arid areas, particularly in the periods of drought, when the rate of economic loss is greatest as a result of natural disasters. This occupation is the greatest insurance against nature in case of drought, famine and other natural disasters. However, the animals that have survived a disaster are under the threat of the lack of food and shelter. The animals that are exposed to a disaster are at risk of malnutrition because the fields in which their food is raised have been destroyed as well as other agricultural products. Depending on the extent and intensity of the disaster, animals could be more stressed and their immune system may have weakened, thus making them more vulnerable to contagious diseases. Deadly epidemics may break out, and the death rate of disaster-stricken animals may increase [4, 5].

2.1. New risks that threaten animal productivity

Although agroterrorism and bioterrorism overlap to some extent, the purpose of bioterrorism is to directly threaten humans with biological organisms, while agroterrorism poses a threat in the form of impairing public health and the economy of the targeted country indirectly, thus undermining its stability with attacks on its plant and animal infrastructure. The main defense in protecting animals against agroterrorism focuses entirely on zoonotic diseases. There may be criminal offenses that aim at agriculture, but which may seem like an accident or negligence. They involve using chemicals potentially fatal to farm animals, which doesn't lead to alert, in which case the intention cannot be clearly proved. A large number of states have included or claim to have included chemical agents directed to farm animals in their biological weapon programs despite the oddity of an attack on a source of food by terrorists [7].

Animal-raising could be one of the easiest targets. Large feed factories can be sabotaged as a specific source, resulting from the distribution of a poisonous chemical agent and resulting in serious losses in a short time. Contamination of feed source with a toxic chemical or the consumption of a chemical which poses a risk at a rate of 1 billionth at a toxic dosage is a lot easier and cheaper than using unusual bacterial pathogens. The purpose isn't clearly known in

cases which have been experienced, or it isn't clear whether it was a criminal offense or a terrorist attack. Some obscurity prevails in this regard, and this obscurity helps the danger to proceed hideously. Historical records reveal that accidental contamination of animal feed will have serious consequences. Intentional contamination is, on the other hand, a field of agroterrorism which requires more attention. Failure to control and collect the feed contaminated with poison, though not contaminated intentionally, would result in this poison being passed on to other animals and potentially to humans. At this point, it is urgently essential to make emergency plans and to take measures. Without permitting a fearful and panicky situation to emerge, the application of emergency plans through an early warning system is the most effective method of dealing with the threat. Inspection of domestic plants which produce feed for farm animals and analysis efforts should be given precedence to. In this age, in which a high awareness of security is predominant, researchers are also conscious of the need not to provide the information which people with ill intentions could use. Therefore, when a contamination or poisoning takes place, those with an efficient network of communication can communicate rapidly and come up with a fast solution. It is also important to develop effective and fast methods of analysis to detect the poisons compatible with food and water sources and to establish fast and economical methods of analysis for food and water [7, 8, 9, 11].

It is important to raise an awareness of keeping regular records of animal productivity and feed sources and to make these records accessible to other farms or agencies which will interfere in emergencies; however, there are certain restrictions on transparent communication due to copyright laws and bigger commercial concerns. There is need for necessary arrangements in order to establish a communication network through which necessary warnings about poisoning or other threats would be received fast only by targeted farms. At this point, it is significant to integrate feed factories into domestic security planning. The rising awareness can prompt scientists to research toxins which are likely to be used in feed and water supplies. Forward planning should be carried out to develop strategies for analysis and quick interference. Although scientists have focused their research on public health and zoonotic diseases as the first line of defense, the existing risks about agroterrorism indicate that the first line of risk-reducing attempts in modern agriculture should be to ensure feed and water security. Consequential planning and management should involve as many threats as possible. Establishing a line of communication between farmers about contamination of animal feed and the threats to the water source and settling a possible event through communication with affected farms without giving harm to the public health and the economy of the country will help to maintain confidence in agricultural production. It is also enormously important to maintain stability and investment in the agricultural sector. Thus, this sector could reply to the demand for food in a sustainable fashion [6].

2.2. The historical background of the threats to feed and water resources

The intentional addition of a poisonous additive to the feed supply of farm animals could be a potential means of conducting a terrorist attack on the agriculture of a state. Historically, such terrorist activities have targeted dairy cattle. During World War II, the English prepared and tested over 5 million cattle cakes which were contaminated with Anthrax and which could be aerially dropped on the pastures of German cattle. It is also claimed that a Kenyan group opposed to the British rule (Mau Mau) ejected herbicide into the animals owned by the British and also used arsenic in the early 1950s. It is reported that members of Klu Klux Klan poisoned cattle in Alabama owned by black farmers. With the intention of intimidating the owners of large farms and threatening them economically, they contaminated water supplies with cyanide salt. As a result, they caused 30 cows to die and 9 to get sick [7, 8, 15, 20]. In another case in which the feed of dairy cattle was intentionally contaminated, an unknown person contaminated a farm silo with a bag of organophosphate-based corn rootworm insecticide. In another case, a chlorine-containing insecticide was intentionally added to animal feed in Wisconsin. The tainted feed was determined to have been distributed to more than 4,000 farms, particularly to dairy farms and caused the products suspected of being contaminated with the harmful substance, including cheese, butter and ice cream, to be called back in the state of Midwest. The rate of acts from chlorine is 1 in 1 billion. Although the accused suspect was reported to be a rival of the targeted farm, the cost of this act to producers of feed alone is estimated to have been more than 250 million dollars. Allegedly, the same person poisoned the feed used for poultry with a fungicide five months after the earlier incident in May 1997. In both cases, letters of threat were sent to customers, indicating that sabotage was carried out. The letters of threat continued to be received until the accused person was arrested. In another case, more than 250 livestock were poisoned with feed contaminated with insecticide in a cattle-raising unit in Nebraska. Although a specific motive wasn't identified in this case, it was suspected that a feed truck had been intentionally contaminated with a compound of neurotoxic organophosphate. The estimated financial cost exceeded $130,000 [7, 9, 10, 20]. In another case coming to the fore in this regard, the long-term effects of accidentally contaminating feed are calculated and still felt even today. As a result of faulty packaging, fire retarders (polybrominated biphenils PBB) were erroneously labeled as magnesium oxide, which is a nutritious feed additive. In the following two years, one and a half million chickens, 30000 livestock, 5900 pigs and 1470 sheep were slaughtered. In the succeeding years, an increasing number of digestive tract cancers and lymphoma, breast cancer and early puberty were documented in animals which were fed on or exposed to PBB-contaminated feed. The level of risk associated with PBB is one in 1 billion [7, 16, 17, 21, 22, 23, 24].

Another case of accidental contamination which had great economical consequences and political outcomes took place in Southern Europe. In the late 1999, poultry producers started to report a significant decline in egg production, chicks displaying abnormal growth, a decrease in the strength of hatching and deaths. The feed contaminated with dioxin supplied by the only producer of oil for animal feed was found to be the culprit. The subsequent research revealed that this substance was contaminated to a single storage tank. This event led to the prohibition of all chicken and pig products by the United States from the European Union. Over 30 states across the world issued warnings about other kinds of food imported from Europe and suspended their

trade with Europe. The estimated financial loss caused by this case exceeded one and a half billion dollars. Three ministers of the government resigned in the Netherlands and Belgium, and the Belgian prime minister lost the election held again in June 1999. The source of dioxin hasn't been officially identified. The European Committee of Veterinarians failed to make the announcement of "completely clean" about the contamination of dioxin until April 2000. Today the main focus in defending livestock against agroterrorism is entirely on the introduction of zoonotic pathogenic organisms and toxins. Another point which requires consideration is to develop defense mechanisms against potential harm to farm animals through the use of fatal chemical toxins [7, 11, 12, 13, 14, 16, 21, 22, 23, 24]. The use of contaminated feed isn't restricted just to chemical agents. The most successful use of a pathogen for farm animals is reported to be homogenizing animal tissues contaminated with rabbit fever due to contamination with rabbit calcivirus and mixing it with such sources of feed as corn, grains and carrot. A case was reported in which rabbits were allowed to eat as much as they liked, thus spreading the disease. This case illustrates that the use of animal feed to contaminate the feed with a biological agent takes less time and proves to be more affective [8, 7].

Varying amounts of a commercial feed to which salinomisin, the feed rate of which is 66 ppm for poultry, was accidentally added, was unintentionally given to 1000 alpacas in 2003. In the third day of the consumption, several alpacas showed clinical indications such as muscular tremors, weakness, diarrhea and violent death. Blood analysis was consistent with rhabdomyolysis. The breakdown of muscular fibers resulted in the release of creatin, kinesis, myoglobin and organic acids into the blood flow. Two farms reported two deaths from acute fatal rhabdomyolysis in the following days. The supply of all feed to these farms was suspended from the second day onwards as a result of rhabdomyolisis caused by ionosphere toxicity. Acute deaths, 5 to 17 per day, were observed on the farms between the 3rd and 15th days. However, an increasing number of myocardial failure and pulmonary edema were observed. Clinical indications shifted primarily to cardiopulmonary ones until the day 7, and the deaths up to then could be attributed to myocardial degeneration. For the fifteen days after the first case was seen, deaths and new cases declined in number, but deaths associated with myocardial degeneration were observed for another three months following the consumption of the feed. Toxicity caused the death of 125 alpacas, and clinical indications were observed on roughly 250 alpacas. It is estimated that the amount of the salinomisin taken in was between 0.5 and 1.5 mg./kg. of the body weight. 628 farms and approximately 2000 alpacas were affected by this contamination. The estimated economic loss of these poisonings exceeded 6.7 million dollars with the dead and harmed animals. Additional losses of income not included in this figure are the cost of lost pregnancies, the loss of babies in the womb and the loss of the incentive which would be received for male alpacas [7]. There is no need for large amounts of a chemical substance in order to produce a toxic effect. None of the cases which involved a biological agent and which resulted in death contains conventional military chemical agent such as sulfur, mustard or sarin nerve agents. The cases given above involved chemicals with legitimate uses but which can also be used for evil purposes. Contaminating a supply of feed with a toxic industrial chemical or another toxic

additive is a lot easier than using bacterial pathogens. The simplicity of a tool and the use of a substance which is an everyday part of agriculture do not affect their perception as a threat [7, 18].

Although it isn't contagious, the failure to control the feed contaminated with toxins and to collect it would result in its transmission to other animals and potentially to humans. It can be asserted that the mass death of a lot of animals in a feeding unit or at the hands of the owner of a large poultry farm is simpler, cheaper and more reliable than using a pathogen. The storage of chemical compounds, their transportation and their transmission to an animal through contamination are much less complicated than with most contagious biological agents. The obvious exceptions are the bacteria, such as *Bacillus anthracis*, which can be turned into a spore. The development of bacteria and viruses into a weapon requires terrorists to have access to improved equipment and trained staff. Killing farm animals is in no way the single threat; breeding viruses and non-sporing bacteria, changing their composition and turning them into a weapon are more difficult compared with sporing bacteria such as Bacillus anthracis. Whether it is intentional or accidental, contamination of the feed does not present any of the technical limitations associated with pathogens. Killing farm animals is in no way the single threat; falsifying other substances for human and animal consumption and creating distrust in the market and the sector could be other reasons. At this point, it is of vital importance to set up an effective system of communication, as well as an early alarm system which would monitor and give information about diseases of livestock and other animals, in case a warning about a threat to feed and water supplies cannot be received. Organizing a team which involves shareholders and the authorities in this field, providing fast communication between the parties involved in order not to arouse distrust, fear and panic among people and organizing the sector in order to allow for constant monitoring and observation are important points in this regard.

3. Result

It could be easier to monitor the composition of the feed and to implement a precaution in place than to respond to the use of an unusual pathogen. A practical method of improving the level of quality control is to integrate operational analytics into the production of feed. Operational analytics is the integration of the system of real-time monitoring and constantly sampling into the process of production. The operational analytics used very commonly in the production of industrial chemicals and drugs as well as in the assessment of quality control could be a precautionary improvement for increasing agricultural security. It is essential to encourage constant monitoring and collecting detailed data from all animal farms in order for the risk management to benefit concerning both pathogens and falsified feed. Investments in tools which would facilitate the quick sharing of case reports and the confirmation of unusual events should be maintained. Disaster management and plans to reduce disaster risks should be dynamic, and

they should be in a continuous process of development as dangers, technologies, laws and standards evolve. These plans should cover the issues of public health, animal health and animal well-being at all the stages of any disaster. The important points which would yield success are the analysis of the risk, planning, education, allocation of funds, communication, integration and coordination with public institutes, cooperation with the private sector and with shareholders outside the public sphere and disaster simulation drills. It is vitally important to give priority to the reduction of the risks in order to avoid future disasters and successfully respond to these disasters. Emergency plans can bring together the shareholders of the agricultural sector and their representatives. These plans should take into account an analysis of the previous shortcomings and include primarily the following points based on the past experience;

- Registration of the farmers covered by the plan and information about the animal population
- Fast assessment and early warning systems for awareness of the situation
- Sufficient knowledge of laws and regulations
- An established chain of command system and a plan for human resources (detailed notification regarding assignment of roles and responsibilities)
- Plans for coordination between other public institutes, local governments, private sector, scientists, non-governmental organizations and farmers as well as an organization in taking action together
- Financial arrangements (the list of requirements for emergency and planning how to acquire them when needed)
- Determination of weak points and fortification of them (e.g. the elimination of gaps and mistakes in the existing management of feeding on farms)
- Plans for communication and precautions for public awareness
- Established sustainable planning and a recovery plan

It is necessary to develop an emergency plan after all the risks which farmers could encounter have been evaluated for the sustainability of farms. Also, this plan should be integrated into the attempts at disaster awareness in order to take measures before they are exposed to a disaster. If there are no emergency plans for the type of the disaster taking place, a step-by-step approach should be adopted, and the farmers should resort to the existing plans for preparing for the disaster, preventing it and reducing the damage.

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