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Disaster and Emergency Foods: Development and Nutritional Strategies

Afet ve Acil Durum Gıdaları: Geliştirme ve Beslenme Stratejileri

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ABSTRACT

Disaster, as defined by the Disaster and Emergency Management Presidency of Türkiye (AFAD), refers to events of natural, human, or technological origin that affect a certain part or all of society, cause physical, social, and economic losses, and stop or interrupt ordinary life and activities. In situations such as fires, floods, earthquakes, avalanches, droughts, famine, and war, one of the duties of the state and non-governmental organizations is to meet the nutritional needs of affected communities. When people encounter emergencies, they experience various nutritional problems. Damage to roads, kitchens, and equipment, which are needed to meet food needs, as well as problems such as hygiene issues, leads to nutritional shortages. Canned or dry foods are often consumed in case of an emergency. However, in emergencies, low protein, fat, and carbohydrate intake can cause poor nutrition. The aim of producing emergency foods is to meet the daily energy requirement of 2100 kcal for an average individual under difficult conditions. These special formulas are preferable in the form of biscuits, crackers, and bars that are low in moisture, easy to consume, and will not pose a risk to food safety and human health. The aim of this study is to briefly review information about emergency foods and their packaging.

Keyword: Disasters, emergency foods, packaging selection, nutritional adequacy

ÖZ

Türkiye Afet ve Acil Durum Yönetimi Başkanlığı'na (AFAD) göre afet; toplumun belirli bir kısmının veya tamamının etkilendiği, fiziksel, sosyal ve ekonomik kayıplara sebep olan, olağan hayatı ve faaliyetleri durduran veya kesintiye uğratan doğa, insan veya teknolojik kaynaklı olaylar olarak tanımlamaktadır. Yangın, sel, deprem, çığ, kuraklık, kıtlık ve savaş gibi durumlarda devletin ve sivil toplum kuruluşlarının görevlerinden biri de etkilenen toplulukların beslenme ihtiyaçlarını karşılamaktır. İnsanlar acil durumlar ile karşılaştığında bir takım beslenme sıkıntıları çekmektedir. Gıda ihtiyacını karşılamaya yönelik yolların, mutfak ve ekipmanların zarar görmesi, hijyen gibi sorun oluşması beslenme sıkıntısına yol açmaktadır. Genelde acil durumlarda konserve veya kuru yiyecekler sıklıkla tüketilir. Ancak acil durumlarda düşük protein, yağ, karbonhidrat alımı zayıf beslenmeye sebep olabilir. Üretilen acil durum gıdaları ile zor şartlar altında olan ve günlük ortalama bir bireyin alması gereken 2100 kcal enerji ihtiyacının karşılanması hedeflenmektedir. Üretilen bu özel formüller düşük nemli, tüketimi kolay, gıda güvenliği ve insan sağlığı açısından risk oluşturmayacak bisküviler, krakerler ve barlar olarak tercih edilebilir. Bu çalışmada amaç, literatürde yapılmış olan bazı acil durum gıdaları ve bu ürünlerin ambalajlanması ile ilgili bilgileri kısaca derlemektir.

Anahtar Kelimeler: Afetler, acil durum gıdaları, ambalaj seçimi, beslenme yeterliliği

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Introduction

According to the Disaster and Emergency Management Presidency of Türkiye (AFAD), disasters are technological, human, or natural events that cause economic, physical, and social losses, disrupt normal life and human activities, and exceed the society's coping capacity (AFAD, 2025). Emergencies and extreme weather events, such as floods and droughts, are increasingly occurring as a result of climate change (Gupta et al., 2022). These events occur every year and affect millions of people (Saggu et al., 2023). Worldwide, more than 14,000 disasters have occurred, 41.4 million people have been displaced, and 4.4 billion people have been adversely affected by these disasters in the last 20 years (Zeng et al., 2024). A report by AFAD (2023) stated that in Turkey, there were avalanches (or extreme snow blizzards) (93), earthquakes (830, magnitude 4 and above), landslides (564), forest fires (1711), mining accidents (7), and floods (2028). On February 6, 2023, two of the most destructive earthquakes in Turkey occurred, with epicentres in Pazarcık, Kahramanmaraş, and Elbistan, Kahramanmaraş. The earthquakes had magnitudes of Mw 7.7 and Mw 7.6, observed at 04:17 and 13:24, respectively. Many people lost their lives (Deprem Dairesi Başkanlığı, 2023). One of the first tasks of governments after disasters, which occur frequently worldwide and significantly affect lives, is to meet nutritional needs. Portions should be sufficient and balanced to provide the energy a person needs. If kitchen equipment is damaged in disaster-affected areas, a mobile kitchen is set up so that the meals are sufficient to meet the needs and reach every person. In disaster situations, non-perishable foods such as canned food, biscuits, and crackers are generally preferred. However, these products may not provide adequate nutrition; therefore, developing special formulations for disaster situations may be a good option. Emergency food formulas (EFF) provide the protein and calories required to support the body in emergency situations and during intense activity (Aydın et al., 2024). An example of this is biscuits, produced by Eti company, enriched with vitamins and minerals, and developed to be used in natural disaster situations. The aim of these products, produced as a social responsibility project by Eti, is to meet more than 30% of the calories that people will need in case of a possible disaster and to determine the utilization rate of 11 different vitamins and minerals, such as iron, zinc, and vitamin D. In addition, they established that the storage period for emergency foods, an important criterion, is 24 months without loss of nutrients (Anonymous, 2023).

In the global context, a number of emergency food products are available for purchase. These include emergency 3600-calorie food bar (SOS Food Labs), Mayday emergency food bars (Mayday Industries Store), and Mainstay emergency food rations (Amazon). The Rations emergency 3600-calorie product has received positive feedback from consumers, who have noted its favorable taste, durable and robust packaging, and a shelf life of 5 years.

In Turkey, in addition to the Eti company products, emergency foods are available under the Akana and Tada brands. Furthermore, there are products such as protein bars, canned foods, and pre-packaged items, with reinforced formulas available for purchase. However, research conducted following the 2023 earthquake revealed issues with nutrition. The Turkish Red Crescent provided menus for general, search and rescue, diabetes, and celiac needs. The general menu was found to be deficient in vitamin C, vitamin K, vitamin D, potassium, and calcium, nutrients to be consumed daily by earthquake victims (Günalan et al., 2024). The average daily intake of vitamin E, sodium, iodine, and phosphorus exceeded the recommended levels. The absence of vitamin C and vitamin D in the diet, in addition to the high omega-6/omega-3 ratio, has the potential to trigger inflammatory responses, compromise immune system function, and elevate the risk of infectious diseases (Günalan et al., 2024). In the research conducted in the aftermath of the earthquake in the Malatya, Adıyaman, and Kahramanmaraş-Pazarcık regions, 45 individuals employed in the Red Crescent were interviewed, with the participants reporting a lack of variety in the menus, which generally consisted of legumes, refined grains, spices, oils, fats, sweets, and sugary beverages. The majority of the staff stated that they were unable to incorporate vegetables, fruits, eggs, and dairy products into the menu. The reasons cited for this were cold weather conditions, organizational issues, stock shortages, and transportation difficulties (Alataş & Arslan, 2024). Nutrition, being a direct contributor to health, assumes even greater importance in disaster situations. Considering these findings, the formulation of novel nutrition-related plans for disaster situations in Turkey could potentially avert malnutrition in such circumstances.

The aim of this study is to compile products developed for emergencies and to provide brief information about the packaging materials used in these products.

Importance and support of nutrition in emergency situations

If the population affected by the disaster is completely dependent on food aid from outside, the prepared food ration should be at least 2100 kcal per person per day. However, if the population is already malnourished and exposed to cold, 100 kcal more should be added to the nutrition plan with every 5 ℃ temperature decrease (Singh, 2010). It is difficult to provide affected people with safe and sufficient food at the right time and place for a sustainable and healthy diet (Bounie et al., 2020). Emergencies have a significant impact on the population in terms of health issues such as disease and nutrition, more than on other aspects of daily life. After the 2011 Great East Japan earthquake, researchers showed that cardiovascular diseases increased (Aoki et al., 2012), as did hypertension (Ohira et al., 2016). The study conducted on pregnant individuals after the 2023 earthquake in Turkey found that their diet was deficient in essential macronutrients such as protein and various vitamins and minerals, particularly among those living in shelters. It was stated that nutritional deficiency, including calcium and vitamin D deficiency experienced by pregnant women, may increase the risk of infant rickets and osteoporosis in mothers, as well as the possibility of premature birth and low birth weight (Kaçar et al., 2024). Lipid-based, or powdered micronutrients can be effective in addressing problems of prolonged nutritional deficiencies after disasters. A report has been prepared on the use of lipid-based nutritional supplements to improve nutritional adequacy in vulnerable groups (pregnant women, children, and breastfeeding women) (Chaparro & Dewey, 2010). Here, lipid-based dietary supplementation is broadly defined as fortified nutritional structures, including both ready-to-use therapeutic foods with relatively low micronutrient concentrations, and high-concentration supplements (1-4 teaspoons/day, providing <100 kcal/day). The aim of these specialized formulations is to supplement nutrition with micronutrients such as calcium, iron, and vitamins that are deficient during emergencies. The report suggests that lipid-based nutritional supplements can improve the overall nutrition of the affected population (Chaparro & Dewey, 2010). Nutrition is essential for people, playing a vital role in protecting physical and psychological health. Considering the studies mentioned above demonstrate that nutritional interventions targeting human health yield positive results. However, the consequences of using these uniform and lacking diversity foods should not be ignored. It should be noted that long-term consumption of ready-to-eat foods may lead to a lack of essential nutrients, low fibre consumption, high salt and sugar intake, and, as a result, digestive disorders such as loss of appetite and constipation (Ainehvand et al., 2018).

Products for emergencies

EF is a special food prepared for use in emergency situations to meet the daily energy requirement of 2100 kcal/day. This food contains 35-45% fat, 10-15% protein, and 40-50% carbohydrate (Afifah et al., 2022). EF products should be designed as durable items with a long shelf life. Shelf-life testing determines the quality of foods during storage. This process may take a long time in actual storage conditions. For this reason, the universally accepted accelerated shelf-life test is used and when successfully applied, gives accurate results regarding the shelf life of the product (Calligaris et al., 2019). EF producers can save time by using the accelerated shelf-life test and by considering the relationship between parameters such as storage conditions and temperature.

In the process of developing a successful EF, the five characteristics to consider are safety, palatability, ease of distribution, ease of use, and nutritional completeness. (Medicine, 2002). For example, in one study, cereal flour (such as Hanjeli and Maize), tubers (such as Cassava and Sweet Potato), pulses (such as Garut and Mung Bean), and freshwater fish (such as Tilapia and Catfish) were used to produce EF in the form of cookies and food bars. The results showed that the cookies and food bars met the EF requirements, especially in terms of total calorie content (248.54-252.82 kcal/50 g), with fat content of (44.20-47.92%), carbohydrate content of (44.50-48.70%), and protein content of (7.10-7.90%), The products were reported to contain high levels of iron (2.63-3.85 mg), zinc (1.28-1.79 mg), and calcium (190.05-231.06 mg) per 50 g, and were intended to meet the nutritional needs of disaster victims. The products were preferred by the panelists based on the parameters of colour, aroma, taste, and texture. Each of these parameters received a score with a value above 4.5 on a 1-7 scale (Sumarto et al., 2023). Nutrition is especially critical for vulnerable groups, including the elderly and children, during natural disasters. It is emphasized that the consumption of nutrient-dense foods is an effective approach to improve the nutritional status of the elderly. Food intervention studies in the form of snacks and meals, including home-delivered meals, provided to malnourished elderly people, improve their nutritional status. In a study by Fatmah et al. (2021), broccoli-soybean-mangrove food bars were prepared to meet the nutritional needs and support weight gain of the elderly in disaster situations. Each 100 g broccoli-soybean-mangrove food bar has 492 kcal of energy, 60.4 g of carbohydrate, 3.8 g of protein, and 24.2 g of fat. Broccoli-soybean-mangrove food

bars have been reported, containing complete macronutrients. They can serve as a source of nutrition for elderly people for only 15 days after disasters. Food bar production, like other well-known energy food products, attracts attention. Bars are usually prepared using products such as rice, oats, corn, milk and milk proteins, soya, and whey. To strengthen the nutritional content, the bars are fortified with vitamins, minerals, or other nutritionally rich ingredients. Bars are popular products in terms of both easy portability and health effects (Constantin & Istrati, 2018). Table 1 summarizes the EF products in the literature. According to the literature, soya flour was used in almost all studies. Soybeans are preferred because they have a high protein content of 34.8% and fibre content of 3.2% per 100 g (Adelakun et al., 2012); they are frequently chosen to strengthen the nutritional content of food formulations (Afifah et al., 2022). High levels of phytochemicals (flavonoids, phenolic content, and antioxidants) and probiotics can be added to prepared foods, in addition to providing energy, to increase immunity and overcome nutritional deficiencies, (Saggu et al., 2023). In one study, banaris bars were produced from sweet potato flour for toddlers and infants. The addition of prebiotics to these bars improved Lactobacillus populations in the body (Rachmat et al., 2019).

The focal point of the research is to ascertain the extent to which the products meet the recommended daily energy requirements and how consumers perceive and address cost issues. A thorough examination of the EP products reveals that they meet the daily energy needs of an individual. For instance, it has been documented that snack bars formulated with a blend of onggok, and cassava composite flour contain 11.06% protein, 1.24% ash, and 8.23% dietary fiber, thereby contributing to nutritional adequacy (Murdiani et al., 2022). Research conducted on refugee populations has demonstrated that the consumption of bars prepared using a flour mixture of banana, mung bean, and mung bean sprouts can satisfy daily nutritional requirements (Mahendradatta et al., 2020). Similarly, the consumption of emergency foods, in the form of cookies prepared from saba banana flour, soya flour, and moringa flour, has been shown to meet daily nutritional needs (Hasan et al., 2020). Although EF products meet energy needs, control samples are preferred in most studies. As the proportion of wheat flour in the content of ready-to-eat products prepared with cooked rice flour, roasted wheat flour, and Bengal gram flour increased, the sensory acceptability results became more positive (Dhami et al., 2019). The closer the products produced here are to traditional tastes and the more suitably they match the palate of the target segment, the more acceptable they are. While individuals tend to consume products that are palatable during disasters; when survival is paramount, the pursuit of flavour may become secondary. Conducting sufficient field studies on this subject, along with gathering information about environmental perspectives and the current stress on emergency foods, could yield valuable insights: into future planning. Considering the comprehensive review of all available information, it is imperative to prioritize the consumer's taste preferences, the safety and nutritional value of the products, the moisture content of the final product, and the selection of appropriate packaging when developing a novel emergency food product. Afterward, it is crucial to determine optimal storage conditions to ensure the safety of both the consumer and the products. Furthermore, it is essential to determine the most effective distribution routes and produce the product in a manner that minimizes cost. Furthermore, products can be produced and stored for individuals with special nutritional needs, such as phenylketonuria, lactose intolerance, and coeliac disease. Additionally, 3D printing models can be used.

Table 1.

Some emergency foods produced

Product types	Components used	Nutritional content of the final product	Research findings	References
EF	Maize flour,soya bean flour, tempe flour, milk powder, icing sugar, cooking oil	For 50 g of product Calorie:233 kcal Protein: 7,9-8,1 g Fat 9,1-11,9 g Carbohydrate 23-35 g	The water activity value of the products was found to be 0.93 and the products were considered microbially safe in weeks 1 and 2 but not in week 3.	Aini et al., (2018)
EF	Soya flour, whole milk powder, sunflower oil, oats, granulated sugar, sesame seeds, salt	For 439 g Calorie: 2194 kcal Protein: 70 g Sugar:158 g Dietary fibre :18 g Total fat: 196 g	Using linear programming helped to reduce the energy level, formulation development and cost of EF products.	Sheibani et al., (2017)
Bar	Black pepper, cinnamon powder, chickpea flour, dried apricot powder, milk powder, egg white, fennel, grated nutmeg, boiled rice flour, barley flour, pumpkin flour, chocolate and cardamom	For 100 g bar Calorie:339,61 kcal Protein: 9,45 g Fat: 6,86 g	It has been shown that bars with good results in terms of sensory properties such as aroma, taste, mouthfeel, texture and general acceptability can be a source of energy and nutrition.	Zahra et al., (2014)
Bar	Corn syrup, granulated sugar, high fructose corn syrup, crystalline fructose corn syrup, oil, lecithin, cellulose, bread flour, soya flour, soya concentrates	50 g for the bar Fat: 24,9 g Protein: 18,39 g Vitamin A: 370 ul/bar Foli acid: 80.7 µg/bar	The bars produced were acceptable, had low water activity and met the energy requirement as a formulation.	Brısske et al., (2004)
Bread	Wheat flour, soya flour, whey powder, skimmed milk powder, yeast, salt, water, egg powder and sunflower oil	For 100 g of bread Calorie: 242 kcal Carbohydrate:41,13 g Protein:8,33 g Total fat:4,88 g Dietary fibre: 2.22 g	The produced breads were subjected to gamma irradiation and microbiological analysis was carried out on the 1st, 7th, 25th, 40th, 40th, 52nd, 69th, 270th and 390th storage days and it was reported that the breads were microbiologically safe for 9 months.	González et al., (2017)
EF	Tapioca starch, ginger oil, water, tuna flour	For 100 g of product Calorie: 203.85 kcal Oil: 12,95 Protein: 15,45 Carbohydrate:64,94 Ash: 2.69	The water activity value was found to be 3.97 and it was reported that the products can meet the nutritional requirements.	Hasbullah et al., (2019)
Instant fish soup	Fish flour, tomato flour, cauliflower flour, sugar, salt, spices, corn flour	Soup containing 10% fish powder Carbohydrate: 65.7 Protein: 9.5 Fat: 1.47 Ash: 14	Soups containing 10% fish meal received the highest score for overall acceptability.	Rahman et al., (2012)
Bar	Nixtamalised corn flour, nike flour, corn starch, chocolate, margarine, egg white, sugar	For a 50 g bar: Calories: 234,92 kcal Protein:5,849 g Fat:9,89 g Carbohydrate:30,37 g	Different cooking temperatures were used, the liking score decreased with the use of nike flour, and the bars were reported to meet nutritional requirements.	Kasim et al., (2017)
instant cream soup	Beef broth, full cream milk powder, dried sweet potato puree, sugar, corn oil, pepper, salt, garlic powder	For approximately 1000 g Protein: 18%, Fat: 20.7%	It was stated by the panellists that the prepared cream soups could be used in emergencies and that the ready-made cream soups containing 20% whole milk powder had the best physical and chemical properties and were the most popular.	Sunyoto et al., (2018)
Ready-to-use therapeutic food (RUTF) spread	Soya flour, corn flour, milk protein concentrate, sugar, cocoa butter, vitamins and minerals, beta-alanine, arginine, Nigella sativa, sesame seeds	For 100 g RTUF Calorie: 525 kcal Carbohydrate: %45 Protein: %13 Fat: %42	Nutrient dense and sufficient RTUF is produced. There was no difference in sensory, physical, chemical properties and peroxide value of RTUFs stored at 38 C for 90 days with fresh samples.	Hadi et al., (2022)

Table 1.

(Continued)

EP	Whey protein nanofibrils, curcumin, quercetin, wheat flour, confectionery fat, sugar	Data not reported	Sensory acceptable, the addition of curcumin and quercetin significantly improved their antioxidant activity and suggested that these products could be used in the formulation of emergency food rations.	Mohammadiana et al., (2021)
Bar (PO-MU-MA)	Potato flour, mung bean flour, sugar, powdered milk, butter, baking soda	100 g for the bar Clorie: 461 kcal Protein: 8.30 g Fat: 22.69 g Carbohydrate: 56.25 g	It was found that the bars had low moisture content (11%), were microbially safe, sensory liked and could meet the nutritional needs.	Ibayan et al., (2024)
EF	Proso millet flour, snakehead fish-tempeh flour *koya*, sugar, margarine, skim milk, and egg	For 50 g of product Calorie: 249.83 kcal Protein: 16.85 %Fat: 19.74% Carbohydrate: 59.82% Ash: 3.59%	The most appreciated by the panellists in terms of crispness and colour was the sample with a ratio of 60% flour millet and 40% eel-tempeh koya.	Anandito et al., (2019)
EF (Food for disaster in accordance with Balinese culture)	Green beans powder, rice flour, peanuts, cashews, Moringa leaf powder, brown sugar	For 100 g of product Calorie: 433,27 kcal Protein: 16.41% Fat: 13.53% Carbohydrate: 61.48% Ash: 1.34% Food fiber 18.87%	It has been reported that the products are microbial safe for up to 10 days and 5 (50 g) portions are sufficient at the end of the correct portion selection. The formulations also received high scores in terms of general acceptability.	Agustini et al., (2022)
Bar	Cassava and red bean flour, skim milk powder, sugar and margarine	100 g gor the bar Calorie: 232.46 kcal Protein: 9.81g Fat: 19.37 Carbohydrate: 62.84 g Ash: 2.52 g	Bars prepared using cassava flour and red bean flour in the ratio 48:52 gave the best results in terms of organoleptic properties and colour.	Hadiningsih et al., (2023)
Bar	Shortening, wheat flour, skim milk powder, sugar, vanilla, cocoa powder, coconut powder, vitamins/minerals, salt, lecithin	Data not reported	The bars were coated with films prepared with whey protein isolate/κ-carrageenan (WC) and red grape pomace anthocyanins and stored at 38 C for 6 months. It was reported that EF can effectively improve the qualitative properties of products and may be an option for the packaging of oxygen-sensitive foods.	Yekta et al. (2024)

The nutritional content of the final product given in Table 1 and the results of the research represent the highest of the products produced.

Selection of packaging for EF products

Food packaging protects the quality and safety of food in the supply chain (Bumbudsanpharoke & Ko, 2022). The main consideration when estimating shelf life is the choice of packaging material (Alamri et al., 2021). Today, packaging materials, which are available at low cost, consisting of petrochemicals such as polyamide, polystyrene, polyethylene, polypropylene, polyvinyl chloride, and polyethylene terephthalate are widely used (Al-Tayyar et al., 2020). The packaging materials selected for EF products should be designed to be resistant to various levels of humidity and temperatures and

distributed under difficult conditions. When determining the packaging material, one should consider that it will protect the vitamins, minerals, lipids, and protein content of the product, and provide long-term preservation. The packaging material should provide an effective barrier against moisture and oxygen transmission. High barrier polymers, such as ethylene vinyl alcohol or polyvinyl chloride, with sufficient thickness to protect products, can be very costly and may have a rough appearance. Metallised films, on the other hand, can provide moderate, but not sufficient, barrier properties for EF products. For these reasons, aluminium foil can be used, but it alone is brittle and prone to tearing. Polymer polyethylene terephthalate (polyester) and polyamides (nylon) can be coated on the outside of the foil by extrusion or adhesives; ideal packaging for EF products can be obtained (Lampi, 1977; Medicine, 2002). When noodles, a hygroscopic product, were packaged in low-density polyethylene, oriented polypropylene, double laminated, and triple laminated packaging materials, the shelf life of noodles increased up to 12, 19, 28, and 42 weeks, respectively (Navaratne, 2018). Another innovation in packaging is active packaging, which is designed not only to preserve food quality by performing additional functions but also to provide an inert barrier against the external environment. These packages constitute a packaging model that interacts with the product to extend shelf life or improve safety and sensory qualities (Fadiji et al., 2023). For example, energy bars produced for emergency situations are coated with a coating solution prepared with pomegranate peel extract, which has been shown to extend the shelf life of the products (Ghorbani et al., 2021). The production of EF noodles involved the utilisation of semolina flour, green tea, soy protein isolate, and spirulina powder. Shelf life was estimated based on organoleptic properties and water activity, followed by an investigation into microbial shelf life. It was determined that shelf life increases when products are stored in low humidity environments; and the inclusion of antioxidant components, such as those found in green tea, has the potential to exert a favourable effect on storage (Shahabinejad et al., 2024). The utilisation of smart packaging technology ensures traceability, quality, and safety of food products. This system assists decision-making by alerting users to potential issues and contributing to the maintenance of quality. The modified atmosphere packaging system is characterized as a food packaging technology based on mixtures of different gases (O_2, CO_2, N_2, etc.) depending on the product to be packaged. A study conducted by O'Connor et al. (2018) involved the preparation of sandwiches for the US military and packaging them in modified atmospheres combined with edible films. The results demonstrated an increase in shelf-life.

Conclusion and Recommendations

Nutrition is of paramount importance for survival in situations such as earthquakes, floods, tsunamis, avalanches, fires, droughts, epidemics, attacks, and wars. In the case of natural disasters, situations such as damage to roads, power, and water cuts, damage to kitchens, and problems in food supply are quite common. It is vital that both the disaster-affected individuals and search and rescue personnel have access to sufficient and balanced food. In light of these considerations, the strategic preparation and distribution of EF products emerges as a promising approach. The objective is to ensure the provision of products that meet the daily caloric requirement of approximately 2100 kcal per individual and provide adequate and balanced nutrients in terms of fat, protein, carbohydrates, and flavor, while ensuring a low moisture content, sensory acceptability, and extended shelf life. The paucity of research in this area is evident from the limited literature on the subject. This dearth of research is primarily attributed to the inability to capture traditional tastes and, more crucially, the cost implications. However, given the functionality of these products, there is a compelling rationale for conducting further research, particularly focusing on the needs of the elderly and children. Additionally, it is recommended that studies be conducted on gluten-free and lactose-free groups, who have specific nutritional requirements. The establishment of disaster warehouses in each region for the storage of these EF products is a proposed solution to address these issues. Future studies should focus on sensory acceptance, consumer preference, and, most importantly, extending the shelf-life of the product using smart packaging techniques.

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