Edible Insects – Sustainable Future of Food Security

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Abstract:

Entomophagy, or the eating of insects, has long been a feature of human diets in many societies, especially in tropical areas. Insects are currently thought to be a staple food for more than 2 billion people globally. Insects are a very varied and underutilized food source, with over 1,900 species known to be edible. Insects are a vital source of protein and other vital nutrients in many parts of Africa, Latin America, and Asia—regions with high rates of undernutrition and protein-energy malnutrition (PEM). In addition to their nutritional qualities, edible insects' minimal environmental impact makes them a possible answer to the world's food issue. Compared to traditional cattle, insect farming uses a lot less land, water, and feed and emits fewer greenhouse gases. Termites, locusts, ants, bees, wasps, grasshoppers, beetles, and caterpillars are among the insect groups that are frequently eaten. The expanding corpus of research on edible insects is examined in this study, with a focus on their potential as sustainable future diets. Incorporating insects into common food systems could help create a more resilient, environmentally friendly, and nutritionally secure future as the world's population grows and strains on traditional agriculture increase.

Keywords: nutritional qualities, traditional agriculture, food source, caterpillars

1. Introduction

Entomophagy is the term used to describe the eating of insects. "Entomophagy" is derived from the Greek words "entomos," which means insects, and "phagein," which means "to eat." The name "insect eating" is the result of combining the two words. Despite being performed in numerous countries across the world, entomophagy is particularly prevalent in parts of Asia, Africa, and Latin America. About 2 billion people have long included insects in their diets as a supplement.

In addition to more temperate places like Japan and some parts of China, insects are widely consumed in tropical and sub-tropical countries like Zimbabwe, Mexico, Thailand, and many more.

In this instance, insects are widely recognized for their nutritional and cost-effective benefits. Wasps, crickets, bees, ants, and grasshoppers are just a few of the many insect species that can be consumed.

According to van Huis (2003), 1400 insect species are thought to be edible worldwide. In Thailand, 164 insect species are collected in great numbers due to the country's widespread consumption of edible insects. marketed, for instance, at supermarkets and marketplaces in Bangkok (Yhoung-Aree and Viwatpanich, 2005). The most important food insect in Southern Africa is the "mopane worm," a caterpillar that is also extensively collected and traded (Kozanayi and Frost, 2002). From an economic perspective, the trade in edible insects is important.

1.1 Nutritional Value of Edible Insects

As a source of high-quality protein, necessary amino acids, healthy fats, vitamins (including vitamin A and B-complex), and trace minerals including iron, zinc, and magnesium, edible insects provide remarkable nutritional advantages (Rumpold & Schlüter, 2013). These characteristics make insects a valuable addition to diets deficient in vital nutrients, particularly in areas where micronutrient shortages and protein-energy malnutrition (PEM) are prevalent.

As an example, the mopane worm (Imbrasia belina), which is consumed extensively throughout Southern Africa, is high in calcium and iron and can have up to 60% protein by dry weight (Kozanayi & Frost, 2002). In Thailand, more than 164 insect species, such as bamboo worms, silkworm pupae, and crickets, are harvested and sold for human food (Yhoung-Aree & Viwatpanich, 2005).

Similarly, in Mexico, grasshoppers (chapulines) are enjoyed for their crispy texture and are often incorporated into local dishes such as tacos and tamales.

1.2 Global Edibility and Economic Impact

Worldwide, about 1,900 bug species have been identified as edible (van Huis et al., 2013). The following insect families are frequently eaten: termites (Isoptera), flies (Diptera), true bugs (Hemiptera), grasshoppers, locusts, and crickets (Orthoptera), beetles (Coleoptera), caterpillars (Lepidoptera), and ants, bees, and wasps (Hymenoptera). These insects are frequently harvested from the wild, but in order to satisfy rising demand, particularly in cities, they are increasingly being raised commercially.

Rural inhabitants rely heavily on the trade in edible insects for their livelihoods. Insect farming presents economic prospects in nations such as Thailand, Laos, and Vietnam, particularly for women and small-scale farmers.

The commercialization of edible insects not only enhances income generation but also contributes to local food systems and circular economies, where waste products such as food scraps or agricultural residues are used to rear insects like black soldier flies and mealworms.

1.3 Environmental and Agricultural Benefits

One of the main benefits of insect farming over traditional animal production is its environmental sustainability. Because they have chilly blood, insects need a lot less nutrition to create the same quantity of protein. For instance, in order to produce the same amount of protein, crickets require twice as much feed as pigs and chickens, six times less than cattle, and four times less than sheep (FAO, 2013).

In addition, insects are an environmentally friendly source of protein in the face of climate change and the depletion of natural resources since they produce fewer greenhouse gases, use less water, and take up less land.

Additionally, some insect species, such as the black soldier fly (Hermetia illucens), can be used to upcycle organic waste into high-value protein and fertilizer, thus contributing to waste management and sustainable agriculture practices.

1.4 Cultural Acceptance and Challenges

Despite the proven advantages, sociological and psychological obstacles prevent edible insects from becoming a common meal, particularly in Western nations. Food neophobia, unfamiliarity, and the "yuck factor" are some of the factors that lead to the resistance. Public attitudes are gradually changing, nevertheless, as a result of growing understanding, media coverage, and the creation of processed insect-based goods (such as protein bars, flours, and snacks). To promote acceptability, government-backed food security programs, culinary innovations, and educational efforts are essential. For instance, the European Union promotes innovation in the field of alternative proteins and has certified a number of insect species for human consumption. A major step toward normalizing insects as a component of a sustainable global diet has been taken with these discoveries..

2. MODERN DAY ENTOMOPHAGY

Ulysse Aldovandi, an Italian entomologist and naturalist born in 1522, is credited with establishing the modern study of insects. De Animalibus Insectis Libri Septem, Aldovandi's 1602 masterpiece, is replete with concepts and allusions derived from his research and firsthand observations. Aldovandi, a cicadas expert, suggested that ancient Far Eastern nations, namely China, relied heavily on insects as a food source. Swarms of Rocky Mountain locusts (Melanoplus spretus) often destroyed rural communities in the western half of the United States, stretching as far north as Canada, during the nineteenth century (Lockwood, 2004). One famous observation said that the locusts covered an extent of 198 000 square kilometers.

The Guinness Book of Records states that this swarm, which weighed an estimated 27.5 million tonnes and contained 12.5 trillion insects, was the largest animal concentration ever seen.

2.1 Rise of the Edible Insect Industry

The market for edible insects is quickly growing from a specialized one to a well-known industry worldwide. Market research projects that the global edible insect market would reach a value of over USD 9 billion by 2030, propelled by rising consumer knowledge of food system resilience, eco-conscious consumer behavior, and the need for sustainable protein substitutes. Start-ups and established companies are innovating with insect-based products such as:

- Protein bars and powders (using cricket or mealworm flour)
- Pasta, bread, and snacks enriched with insect protein
- Insect-based pet foods and animal feeds
- Supplements for livestock and aquaculture, reducing reliance on traditional fishmeal and soy

With robust government funding and regulatory development, nations like Thailand, France, and the Netherlands are at the forefront of insect farming technologies. For example, under the Novel Food Regulation, the European

Union has approved a number of insect species as acceptable for human eating, such as Acheta domesticus (house cricket) and Tenebrio molitor (mealworm).

2.2 Entomophagy and Food Innovation

Today's entomophagy is strongly related to sustainable technology, food science, and culinary experimentation. In order to improve palatability and lessen the "yuck factor," insects are being added to well-known formats. Consumers are more accepting of insect-based flours and protein-enriched food products that look like traditional snacks than they are of eating live insects. Insect-based foods are being tested by chefs, food technologists, and researchers for use in gourmet cooking, school lunch programs, and disaster relief food packages. These innovations are helping normalize entomophagy and position it as part of a modern, forward-thinking food culture rather than a novelty.

2.3 Consumer Perceptions and Market Integration

Even with scientific proof of the nutritional and ecological benefits of insects, modern entomophagy continues to encounter cultural and psychological opposition, particularly in societies where eating insects is not common. Research indicates that social influence, education, and familiarity all have a big impact on how consumers accept products. In addition to nutritional claims, marketing efforts now emphasize environmental benefits including decreased greenhouse gas emissions and water usage. Influencer and health expert endorsements, together with sustainable lifestyle branding, are also essential for generating interest, especially among Gen Z, millennials, and fitness-conscious customers.

2.4 Institutional Support and Policy Development

The importance of insects in creating robust food systems is starting to be acknowledged by governments and international organizations. Since its seminal 2013 report, "Edible Insects: Future Prospects for Food and Feed Security," the Food and Agriculture Organization (FAO) has promoted insect farming. Standards to control the production, processing, and distribution of edible insects are being developed by a number of national food safety bodies. Education and research institutions are also launching initiatives to promote entomophagy, with universities offering courses, hosting insect-themed food festivals, and supporting start up incubators in the field of alternative proteins.

MAJOR GROUPS OF EDIBLE INSECTS

The most commonly consumed insects in the world are pests (Coleoptera); other edible insect groups include 1) Lepidoptera-caterpillar 2) Hymenoptera, or bees 3) Orthoptera: cricket, locust, and grasshopper 4) Hemipteran bugs, cicadas, leafhoppers, and plant scale insects and hoppers 5) Termites (Isoptera) 6) Dragonfly Odonata 7) Dipteran flies

3. WHY ARE INSECTS NOT EATEN IN WESTERN COUNTRIES?

The lush Crescent, which comprises the Nile Valley and Delta in northeastern Africa and the verdant regions of western Asia, is believed to be where agriculture first emerged. Domestication of plants and animals as well as food production swiftly spread throughout Europe (Diamond, 2005). The most desirable wild animal species for domestication were large terrestrial mammals that were herbivores or omnivores. There are fourteen domesticated mammals in the world.

In addition to providing meat, which is the main source of animal-based nourishment, these animals also served as ploughs, transportation, warmth, milk, leather, and wool. It is believed that it was due to the utility of these creatures. Insects other than honeybees are used. Most Westerners perceive entomophagy with distaste (Rozin and Fallon, 1987). Because they associate eating insects with primitive behavior, many individuals are reluctant to do so (Vane-Wright, 1991; Ramos Elorduy, 1997; Tommaseo Ponzetta and Paoletti, 1997). Scale insects and silkworms found it difficult to gain traction in Western nations. Simply put, insects are unable to offer the same advantages.

What is and is not edible is determined by culture, which is impacted by elements like history, environment, community structure, human endeavor, mobility, and political and economic systems (2). Mela (1999), Volume 26. According to Mignon (2002), cultural factors influence whether entomophagy is accepted or rejected.

4. WHY ARE INSECTS CONSUMED IN THE TROPICS MORE THAN IN TEMPERATE AREAS OF THE WORLD?

It's commonly believed that eating insects is only found in tropical areas. In temperate regions, such as China and Japan, people eat insects (Feng and Chen, 2003; Mitsuhashi, 2005). (Ramos Elorduy, 1997) from Mexico. Because there are more insects in the tropics, harvesting is simpler. Like people, insects need oxygen and produce CO2 as waste. Insects breathe through their trachea instead of their lungs. The gases are mostly Larger insects are seen in warmer regions due to faster diffusion at higher temperatures (Kirkpatrick, 1957). Fossil evidence suggests that insects had bigger body sizes throughout the late Palaeozoic period (Shear and Kukalová-Peck, 1990), reaching up to 1 meter due to higher air temperatures. Insects congregate in large quantities in the tropics, making harvesting effective. Harvesting is made easier in the evening and early morning when locust swarms settle at night. Large clusters of forest caterpillars are a natural occurrence. Insects like the oak caterpillar (Thaumetopoea processionea) and Mormon cricket (Anabrus simplex) are also found in temperate regions. According to Madsen and Kirkman (1988), Native Americans most likely consumed Mormon crickets. The tropics offer a wide range of edible bug species year-round. In temperature zones, insects hibernate during frigid winters. During this time, there are no active insect species, and their development stops. Palm weevils can be discovered on palm trees that have fallen due to typhoons or intentionally felled to deposit eggs (Choo et al., 2009). Bamboo caterpillars are found in bamboo stalks, dung beetles in dung piles, and army termites in termite mounds.

5. WHERE AND WHEN ARE INSECTS EATEN?

The prevalence of eating insects is not well known worldwide. Latin America, Asia, and Africa have very few literary examples. On the African continent, insects are common, particularly when staples They become vital food sources when they are scarce. During the rainy season, when hunting fish or animals may be difficult, insects are essential for ensuring food security.

About 150 to 200 species of edible bugs are eaten in Southeast Asia. The Sago palm (Metroxylon sagu) is home to red palm weevils (Rhynchophorus ferrugineus), which are prized as a delicacy throughout the continent. (Johnson 2010). The year-round availability of dragonfly larvae, diving beetles, and enormous water bugs contrasts with the seasonal availability of grasshoppers, cicadas, and weaver ants. Mexican indigenous people are well-versed in the life cycles of insects as well as the plants and animals they consume (Ramos-Elorduy, 1997). Insects have been "calendarized" to correspond with the phases of the moon, the rainy seasons, and the life cycles of plants (International Letters of Natural Sciences Vol. 26 3). thunder. Indigenous people are aware that escamoles (Liometopum ant larvae) are ready for harvesting when the jarilla plant (Senecio salignus) blossoms.

6. NUTRITIVE VALUE OF INSECTS

The high protein content of insects, which contains amino acids like methionine, cysteine, lysine, and threonine, makes them a nutrient-dense food source. Fat, carbohydrates, a few essential vitamins (A and B), complex, C, and minerals (calcium, iron, zinc, and phosphorus) Johnson, 2010; Xiaoming et al., 2010; Capinera, 2004). 50–60g of protein per 100g dry weight is found in caterpillars, compared to 23–36g in palm weevil grubs, 41–91g in Orthoptera, 7–25g in ants, and 35–65g in termites (Bukkens, 1997; Ramos-Elorduy, 2005). This amount is greater than that of broiled cod (28.5g) or ground beef (27.4g) (Banjo et al., 2006; Okaraonye and Ikewuchi, 2008).

Yhoung-aree (2010) states that the highest concentration of amino acids per 100g dry weight is found in silkworm larvae, which are followed by house crickets (68.7g) and bamboo caterpillars (77.5g). Termites, caterpillars, and the grubs of palm weevils (Rhynchophorus spp., Curculionidae) are insects that are high in fat (Bukkens, 1997). In dung beetle (Oryctes sp. (Coleoptera: Scarabaeidae)) grubs (Banjo et al., 2006), palm weevil grubs (Onzikou et al., 2010), and adult house crickets, calcium concentrations of 61.3, 72.4, and 76g/100g dry weight have been recorded. Vogel (2010). Banjo et al. (2006) found that the maximal iron concentrations in termites and caterpillars were 27–29 and 35.5g/100g dry weight, respectively. Feng et al. (2000) found that grasshoppers and the gigantic water bug Lethocerus indicus (Hemiptera: Belostomatidae) have the highest phosphorus concentration at 226-238g/100g. A high amount of Magnesium (7.54-8.21g/100g) has been identified in grasshoppers and weevils (Banjo et al., 2006). Honeybee eggs, larvae, and pupae contain high levels of vitamins A, B2, and C, with values of 12.44mg/100g, 3.24mg/100g, and 10.25mg/100g, respectively (Bukkens, 1997).

Insects can provide up to 776.9kcal/100g, more than soybeans, maize, or meat (Ramos-Elorduy, 2005).

According to a recent study conducted in Kenya, customers preferred wheat buns supplemented (5% mix) with the termite Macrotermes subhyalinus Rambur (Isoptera: Termitidae) above regular breads in terms of size, color, texture, and aroma. Higher levels of riboflavin (0.17 vs 0.26 mg), niacin (0.90 versus 1.11 mg), folic acid (0.30 versus 0.33 mg), calcium (10 versus 10.83 mg), iron (1.20 versus 1.80 mg), and zinc (2.78 versus 3.23 mg) were also found by Kinyuru et al. (2009) compared to regular bread. Because of its high unsaturated component content and favorable physiological characteristics, the oil produced from R. phoenicis grubs is utilized as edible oil (Okaraonye and Ikewuchi, 2008; Onzikou et al., 2010).

Eating silkworm caterpillars can meet one's daily needs for copper, zinc, iron, thiamine, and riboflavin. Eating insects that contain this amino acid can also help one who is riboflavin deficient (Gordon, 1998). In addition to

using fewer resources than animal protein, insect protein manufacturing is environmentally sustainable (Gordon, 1998).

7. RECENT DEVELOPMENTS IN INSECTS COLLECTION

The grubs of R. phoenicis and the coconut rhinoceros beetles (Scarabaeidae), which belong to the Coleoptera group, are commonly consumed in Nigeria (Ekpo and Onigbinde, 2005) and the Democratic Republic of the Congo (DRC) (Onyeike et al., 2005; Onzikou et al., 2010). Dung Beetles, like Heliocopris bucephalus (Scarabaeidae), are usually collected in the morning from bovine dung and placed in a jar with water to soak for 12 hours or until their intestines are completely empty of food before they can be cooked (Hanboonsong, 2010). The Dipteran order's lake flies, or Chaoborus spp. (Chaoboridae), rise like clouds from Lake Victoria in East Africa. They are collected by Natives using spinning baskets after being swept from rocks and plants. According to van Huis (2003), the cake is made by grinding flies and then letting it dry in the sun. Water bugs are traditionally collected at night near lights in Mexico, where insect eggs are known for their flavor. Leptocorisa oratorius (Coreidae) and Nezara viridula L. (Pentatomidae) are two rice bugs that farmers in Borneo love. They mash the bugs with chiles and salt, then fry them on hollow bamboo stalks. Chung (2010) claims that the dish is served as a condiment. In China, the massive water bug L. indicus is either roasted and eaten whole or ground into a paste with chiles (Feng et al., 2000). In China, Java, and Japan, wasps or honeybees are used to produce honeybee and social wasp larvae, pupae, and sometimes adults that are roasted or grilled over a fire (Edwards, 1998; Feng et al., 2010). The larvae and pupae of the stingless bee (Apidae), giant honeybee A. dorsata F., dwarf honeybee A. florea, and gregarious honeybee Apis cerana are eaten with honey, stir-fried, or boiled with rice or porridge. The brood and hive are sometimes crushed to create a liquid, which is then brought to a boil (Adalla and Cervancia, 2010; Chung, 2010). In mountainous areas of Japan, the larvae of the common wasp Vespula flavipes L., the Asian giant hornet Vespa mandarinia Smith, Vespa spp., and Ropalidia spp. (Vespidae) are either boiled with soybean sauce until they are hard or fried with salt. The cooked larvae are then mixed with rice (Chung, 2010; Nonaka, 2010). Australia and the arid and humid regions of Central Africa are home to large termite colonies. Although feeding the queen and reproductive forms is common worldwide, soldiers are preferred in Venezuela (Paoletti et al., 2003). They are gathered in the evening by placing a basin of water directly under the light source, which is the most popular and simple technique in the tropics. Termites are drawn to and stuck on the water's surface as a result of light reflection (Chung, 2010). In contrast to the mulberry silkworm, the eri silkworm Samia ricini Donovan, and the pupae of the Chinese oak silk moth Antheraea pernyi Guerin-Meneville, moth and butterfly caterpillars have been consumed as food in many parts of the world. The bamboo caterpillar O. fuscidentalis and the cassia butterfly Catopsila pomona (Pieridae), which are both high in proteins (25 mg/100 g dry weight), have been reported to be consumed in Southeast Asia (Yhoung-aree et al., 1997). Indigenous women in South Africa's Kalahari region squeeze out the intestines of caterpillars and then burn them over hot sand and ash. To consume them whenever they need to, they store sun-dried caterpillars in sacks. Dried caterpillars are frequently ground into a powder and used with stewed watermelon for this purpose (Nonaka, 1996). Dragonflies, such the red-veined dropwing Trithemis arteriosa Burm (Libellulidae) and the larger green emperor dragonfly Anax guttatus Burm (Aeshnidae), can be found in paddy fields in the DRC, the Philippines, and the north and northeast (Malaisse, 1997). Thailand (Pemberton, 1995) and China (Feng et al., 2001). Nymphs are often stir-fried or prepared before consumption. Africans consider crickets, locusts, and grasshoppers to be delicacies (Mbata, 1995).

The grasshoppers (Acrididae), which are quiescent in the morning and evening, include jumping insects such as Acanthacris ruficornis, A. nigrovariegata Bolivar, and Locusta migratoria migratoriodis (L.) Villagers use brooms made from the leaves or branches of neighboring trees to keep grasshoppers away from homes and trees (Mbata, 1995; Nonaka, 1996; Roulon-Doko, 1998). Early in the morning, when crickets are resting on low tree branches or grasses, is the ideal time to gather them. In Thailand, a small hole excavated near the nest is filled with water. It is easy to hand collect the crickets as they come to the surface (Hanboonsong, 2010). Farmers stir-fry the insects without oil (Chung, 2010).

8. PRACTICE OF EATING INSECTS IN INDIA

In many regions of India, it is traditional to eat honey bee comb in addition to the brood, which is made up of the eggs and larvae. Strangely, some Indian tribes eat the pupae of silkworms. In a 2013 research, the Food and Agriculture Organization (FAO) suggested that insects might be used as a meat substitute in the event of a food shortage in the next century due to their high nutritional value.

9. EDIBLE INSECTS ECOLOGY

The edible insect resource is mostly a non-wood forest product (NWFP) obtained from natural resources (Boulidam, 2010). Edible insects can be found in a variety of habitats, such as forests, fields, and aquatic situations. On a smaller scale, edible insects can thrive in soil, consume the leaves of plants, or reside on tree trunks and branches. Insect ecology is the study of the interactions between individual insects, insect groups, and their environments. Population dynamics, climate change, and processes like pollination, migration, and nutrient cycling are all included in this. Many species have long been prized for their products, such as cochineal insects, honeybees, and silkworms, but nothing is known about many others.

9. 1. Collecting from the wild: potential threats and solutions

Insects provide essential ecological services such pollination, composting, wildfire prevention, and pest control (Losey and Vaughan, 2006). Edible insects like weaver ants, dung beetles, and honeybees—which are commonly consumed in the tropics—perform several of these activities. ecological services. There are several human-caused factors that harm edible insect populations. Direct competition with other predators as a result of collection may pose a hazard to the species' survival (Choo, 2008). Many species of edible insects are either predators or decomposers. A decline in their numbers could impact ecosystem services and negatively impact populations of other insect species.

Overexploitation (Morris, 2004; Schabel, 2006) is another major barrier to the current and future usage of entomophagy, particularly if the number of individuals (both adult and immature) collected exceeds the capacity for regeneration (Cerritos, 2009). Furthermore, the stability and regeneration of edible insect populations may be threatened if collection techniques become less selective (Latham, 2003; Illgner and Nel, 2000; Ramos Elorduy, 2006). When adult insects are collected before to their initial mating or egg-laying, for example, this happens (Cerritos, 2009). Finally, like with many other natural resources, habitat loss, such as pollution, deforestation, and forest degradation, is putting edible insect populations under further stress (Morris, 2004;

Ramos Elorduy, 2006; Schabel, 2006). In order to increase and make it easier to capture insects, host trees are frequently felled.

9. 2. Conservation and management of edible insect resources

When discussing biodiversity, scientists usually employ three layers: ecosystem, species, and genetic. Biodiversity can significantly contribute to improved nutrition and food security (Toledo and Burlingame, 2006). Taking into account the ecological roles that insects play, There has been a recent surge in interest in the preservation of insects and their environments, which are considered vital to human existence (DeFoliart, 2005; Samways, 2007). "Flagship species" are marketed to raise public awareness of conservation efforts (Simberloff, 1998). According to Robertge and Angelstam (2004), conservation biologists classify "umbrella species" as typical species whose preservation is thought to indirectly benefit numerous naturally co-occurring species and their ecosystems.

Despite their size, these species are worth considering because of their significant contribution to the provision of essential ecosystem services, the potential for edible insect species to act as flagship species and/or umbrella species protecting other natural resources, and the significance of iconic mammals like giant pandas and tigers (Yen, 2009; DeFoliart, 2005). Since they are believed to be harmful to tree populations due to their consumption of young leaves, or tree foliage, caterpillars have historically been considered pests by forestry professionals and the forest business. In reality, though, trees respond to this type of browsing by producing more leaves. According to N'Gasse et al. (2004), trees were unaffected by caterpillars eating leaves.

As long as no trees are felled during the caterpillar harvest, gathering caterpillars in the forest may really be regarded as a biocontrol technique (Vantomme, Göhler, and N'Deckere-Ziangba, 2004).

10. DISCUSSION AND CONCLUSION

Entomophagy is something that consumers and company owners who grow insects need to be aware of (Nonaka, 2005). Customers are occasionally willing to pay more for street food that is prepared, stored, and sold in a hygienic manner, including precautions for insects. condition (Akinbode et al., 2011). In 2010, the Southern Institute for Appropriate Technology made an attempt at this by hosting an international seminar on "The potential of edible insects" in Linvile, Alabama, USA. In a similar vein, the FAO's 2008 workshop on "Edible insects" in ChiangMai, Thailand, was a huge success. After all, international initiatives that are to be started in those nations that are experiencing severe food shortages can revalidate entomophagy.

Therefore, a comprehensive and interrelated global approach is needed to ensure sustainable and equitable food security (FAO, 2010). According on the existing findings, next study should concentrate on thorough In the current era of limited edible food sources worldwide, surveys of insects, literature searches, research on the nutritional value of unknown species as well as socio-economic factors (including consumer acceptance of these foods) will open up new avenues for food security. Natural Sciences International Letters, Vol. 26, 7. In order to address the current global food problem, this innovative entomophagy technique can play an interdisciplinary role in forestry, traditional medicine, agriculture, and animal husbandry.

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