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Desert Locust on Feed Food Insecurity and Ecosystem Disturbance

Mebrate Getabalew

Holland Dairy Private Limited Company, Milk Collection Point Quality Coordinator, Debrezyite, Ethiopia

Abstract: Desert locust is internationally migratory pastes which destruct the ecosystem, feed and food security in different African, Middle East and south and south Western Asia. The aim of this paper is to access the effect of desert locust on feed food insecurity and ecosystem disturbance. The Food and Agriculture Organization of the United Nations (FAO) estimated that the desert locust impacts the livelihood of 1 in 10 people, making it the most dangerous migratory pest in the world. Swarms of desert locusts can be huge, containing up to 10 billion individuals and stretch over hundreds of kilometers. The impact of desert locusts on food security could be the most devastating in countries that rely heavily on agriculture. Under normal circumstances, desert locusts are usually restricted to the semi-arid and arid deserts of Africa. Green vegetation and moist sandy soils are favored for breeding. An average swarm can destroy as much food crops in a day as is sufficient to feed 2, 500 people and pasture biomass. Losses due to locusts are not limited to damage to pastures and crops. The rapid loss of vegetation cover may result in soil erosion and increased runoff. Outbreaks of this paste destroy food sources for many animals and thus affect biodiversity.

Key words: Agriculture · Biomass · Pastures · Pest · Soil Erosion and Vegetation Cover

INTRODUCTION

At the first time of civilization, desert locustsare the most devastating threats to agriculture. This insect contains 100 of pest species and affects the livelihoods of one individual out of 10 people worldwide [1]. Desert locust is profoundly and qualitatively different from other pests: Their populations are very vast and swarms that can affectrangeland or crop within a very short time. Canfly 100km/day and invade areas covering millions of square kilometers, resulting in major economic, social and environmental impacts on feed food insecurity and biodiversity disturbance. Control campaigns commonly cost many millions of dollars [2] and the large amounts of chemical insecticides used and have serious side effects on the environment and other animal and insects.

Desert locust is the most dangerous paste and it is normally foundinarid and semi-arid areas across 20 countries between West Africa and India, covering nearly 16 million square kilometers. Green plant cover and moist sandy soils are favorable for breeding. A typical desert locust swarm can contain up to 150 million locusts per square kilometer [3]. The situation is particularly worrisome in Ethiopia, Somalia and Kenya. Swarms of Desert Locusts are extremely large, highly mobile and are damaging food crops and forage [3]. When the outbreak occurs, all types of vegetation are subject to attack. Damage can be considerable on all types of crops: annual rain-fed crops as well as perennial crops, tree cultivation and irrigated crops which are even more sensitive since they are exposed throughout the year. Pastorals zones are also subject to major destruction, affecting both total biomass production and its palatability for livestock.

In the past, losses due to desert locust outbreaks were unfortunately too rarely evaluated. In Niger, these losses were estimated at approximately 50% of the 1000, 000 ha of grazing land and at about 33% of approximately 12, 000 ha of attacked rain-fed crops. In Mali, the losses were estimated from 65% to 90% of the 700, 000 ha of grazing land, from 5 to 75% of the 300, 000 ha of rain crops, from 85% to 100% of the 550 ha of market gardening crops and 35% of the 200 ha of perennial crops (arboriculture) [4]. So the objective of this review paper is to access the effect of desert locust on feed food insecurity and ecosystem disturbance.

Desert Locusts and Their Impact: There are more than 500 species of acridids which can affectpastures and crops and around 50 of them are considered major pests.

Corresponding Author: Mebrate Getabalew, Holland Dairy Private Limited Company,
Milk Collection Point Quality Coordinator, Debrezyite, Ethiopia. E-mail: mebrate1221@gmail.com.

Although desert locust outbreaks are now better controlled and invasions are often shorter and reduced in extent, large outbreaks of desert locusts continue to occur in many parts of the world [5]. Large-scale control programs can also affect biodiversity, including that of non-target grasshoppers and other arthropods [6]. However, at moderate densities, locusts and grasshoppers are an essential component of ahealthy rangeland ecosystem [7], in that they stimulate plant growth and participate in nutrient cycling and the food chain [1]. Therefore, management does not aim to eradicate them but decreasetheir population below economic thresholds.

The horn of Africa is facing the worst desert locust crisis in over 25 years and the most serious in 70 years for Kenya. The current situation is set to become a regional plague, as several regions are now being affected simultaneously which represents an unprecedented threat to food security and livelihoods in the region and could lead to further suffering, displacement and potential conflict [3]. Food and Agricultural Organization (FAO) has the following responsibilities with respect to desert locust forecasting and control operations: (i) as a forum for discussion for the development of appropriate policies, strategies and plans; (ii) coordinating knowledge and information related to the distribution and abundance of desert locusts; (iii) strengthening of National Locust Control Units and promoting collaboration at the regional level; and (iv) declaring desert locust emergencies, organizing international assistance and providing technical advice in support of the control activities to be undertaken.

Current Progress in Understanding Locust: Outbreaks of desert locust are common in recent years. For desert locusts, there is stage transformation to form bands and swarms during outbreaks and plagues, but the importance of the solitary phase in population dynamics has been demonstrated in various species. Use of population genetic tools like molecular markers has demonstrated that solitary-phase locusts are much more mobile and abundant and with the desert locust, migrations of the solitary phase are a key adaptation for survival in a hostile environment [5]. The recent progress review by Cullen *et al.* [8], details numerous aspects of locust phase polyphenism.

There were several new sightings of immature swarms in Samburu County in northwest Kenya but other swarms prevailed near the border of Uganda in Turkana County. Cool temperatures and local winds have limited their ability to migrate northwards. In northern Somalia, immature swarms persist on the plateau in the northwest and northeast. Other swarms werefound in adjacent areas of eastern Ethiopia between Jijiga, Harar, Dire Dawa and the Djibouti border and numerous swarms are in the Afar region, partially as a result of several swarms migrating from Yemen. Good rains have caused large areas of green vegetation to develop that will allow breeding and a further increase in locust infestations during August and September. Poor control measures were undertaken in a few places [3].

There was an unconfirmed report of a swarm on the Red Sea coast near the Sudan/Eritrea border that may have arrived from Yemen. In Southwest Asia, summer breeding continues along both sides of the Indo-Pakistan border. In Pakistan, hopper groups and bands continue to form in the Nagarparkar area of southeast Sindh where fledging has started and adults are forming small groups of adults. There remains a risk that a few swarms could still arrive from northern Somalia. In West Africa, low numbers of solitarious locusts are present in the summer breeding areas of the northern Sahel in Chad, Niger and Mauritania where local breeding will occur in areas where rains fell recently much further north than normal [3]. If not controlled, the desert locusts could continue moving within Ethiopia and invade northeast Kenya, the western lowlands and highlands of Eritrea, the Red Sea coastal plains in Eritrea and adjacent southern coastal areas in Sudan.

Factors Leading to Desert Locust Outbreak: There is increasing evidence that human activity may have contributed to desert locust outbreaks. Changes in the environment in West Africa like, deforestation, increased cassava cultivation and the spread of Asteraceae may have been responsible for the increase of the economic importance of the variegated desert locust. Overgrazing is a common cause of outbreaks for some species such as the Moroccan locust in North Africa and central Asia where sheep create favorable conditions for gregarization. In Australia [9], has concluded that swarms of *Austroicetes cruciata* and *Chortoicetes terminifera* may have resulted from the ecological changes that followed the introduction of European livestock and agriculture.

For some kind species, the relation of outbreaks with rainfall is quite complex. In Indonesia, it is usually too humid for the migratory locust, but outbreaks in the late 1990s could be explained by drought associated with the El Nino phenomenon [10]. For the migratory locust in China and central Asia, floods followed by dry periods are important for outbreaks in that after floods recede, large areas of green vegetation become favorable for the locust breeding [2].

Fig. 1: A swarm of desert locust invades parts of Mwingi Town in Kitui Country, Kenya, Feb.20, 2020 (Xinhua/Zhang Yu)

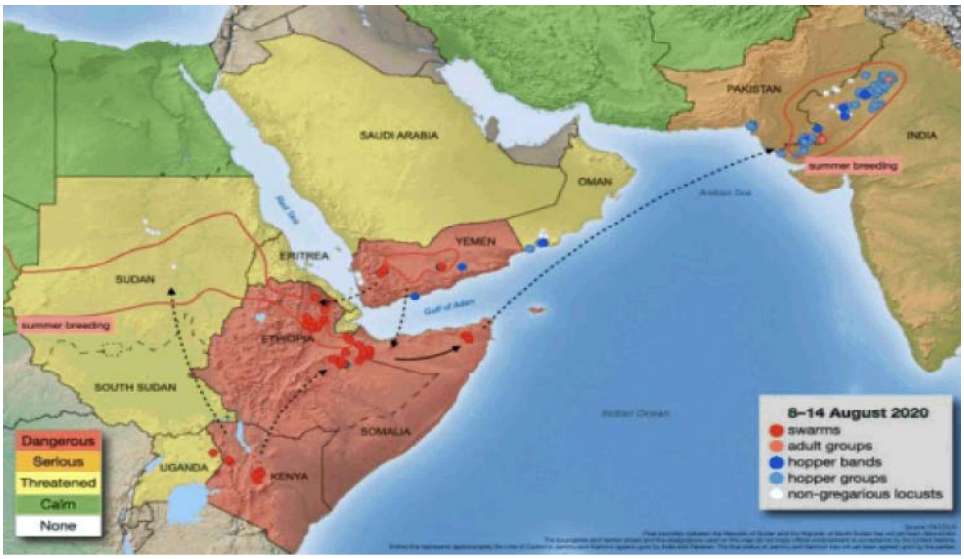

Fig. 2: Desert locust situation. Source [3]

Locust impacts on people are well-documented, but humans also influence locust population dynamics and distributions directly through control and indirectly through land use/land cover change; however, the latter has not been reviewed and summarized. Mix-feeding locusts tend to be highly polyphagous, eating broadly from many plant families. This adaptation allows them to persist in and migrate through many landscape types. It also makes plagues significant threats to livestock forage and pastures, as well as a broad array of crops. Several of these species prefer overgrazed, or otherwise disturbed, habitat, potentially due to increased bare soil for laying eggs and thermo regulating [11].

Out of 19 locust species 12 of them are grass-feeders. Grass-feeders theoretically only feed onplants belonging to the family Poaceae. However, this designation is nuanced on two levels. Firstly, grasses belong to the fifth-largest plant family with over 10, 000 species and are very ubiquitous in their distribution [12]. Secondly, following gregarization locust host-plant range expands considerably [13]. Grass-feeders are thus typically present in grassland and pastures where they compete with livestock. They readily feed on Poaceae of economic interest like cereals or forage, but they can also cause serious damage to non-grass crops during outbreaks [11].

Most locusts originate in grasslands. These ecosystems are subject to expanding agriculture, urbanization, energy development and desertification, making them among the most threatened biomes on Earth [14]. Increasing grazing pressure and agricultural intensity may inadvertently be creating a nutritionally optimal environment for locusts through soil degradation. In addition to presenting bare areas favorable to egg lying and thermoregulation, degraded pastures may harbor plants with lowprotein: carbohydrate ratios that are favorable to locusts. Soil erosion typically decreases soil nitrogen resulting in low nitrogen plants [15]. In many cases livestock grazing has positive effects on locust populations, which can lead to food insecurity.

Fig. 3: Desert locust on rangeland (A) and crop land (B)

CONCLUSION AND RECOMMENDATIONS

Now a day desert locusts have a major effect on feed food security and disturbance of the ecosystem. In normal circumstances, desert locusts are usually found only in semi-arid and arid deserts area. When we implement chemical pesticide for desert locust control, it affects non-target organisms and ecological systems, new methods must be discovered and implemented. Locust outbreaks are often international in nature and trans boundary movement is common. Locust population density is monitored and forecast using an information platform that is built with high technologies, such as geographic information systems (GIS), global positioning systems (GPS), remote sensing (RS) and information technology (IT)/computer science. With this platform, people make decisions for control according to locust densities and location of infestations.

- Based on this review and outbreak of the desert locust the following recommendations are forwarded to the concerned bodies as regional or global level.
- Increased ground surveillance for early detection of egg or larvae of the locust.
- Use of wind forecasts, to help pre-empt trajectory of desert locust bands and swarms.
- Immediate regional mapping of current invasion and announce for the concerned body.
- Targeted aerial and ground spraying should be implemented.
- Give incentive to people toreport any outbreak of desert locust.

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