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Pakistan, Locust Plague

Pakistan:**The discussion on the aftermath & solutions of the locust plague**

**Introductio
n**

Since June 2019, the eastern part of Pakistan has been constantly influenced by locusts. Towards the end of May and early June in 2019, it was reported that in Nara Desert in Pakistan locusts appeared. This locust swarm became serious, since Pakistan is a country highly leant on agriculture, and the agriculture of which was almost ruined by locusts. This essay is discussing the negative influence of locust in Pakistan, giving new solutions in solving locust in this district, and aiming to use this very example to help with the prevention and control of locust plague in the whole nation.

Overview of the nation's population and agriculture

1. Population

Pakistan's population in 2020 is estimated at 220,892,340 people at midyear according to UN data. The population density in Pakistan is 287 per km2 (742 people per m2). 35.1 % of the population in this country is urban (77,437,729 people in 2020)[i]

2. Agriculture

Agriculture is observed as the pillar of Pakistan's economy, which heavily depends on its major crops. Pakistan's major natural resources are farmland and water. Agriculture accounts for about 18.9% [ii]of Pakistan's GDP and employs 42.3% of the labor force. In Pakistan, Punjab is recognized as the province with the largest agricultural output where wheat and cotton grows. Mango orchards are mainly distributed in Sindh and Punjab provinces which make Pakistan the fourth largest mango producer in the world.[iiiiv]

The most important crops in Pakistan are wheat, sugarcane, cotton, and rice, which altogether account for more than 75% of the total output value of crops. Pakistan's largest food crop is wheat. As of 2018, the wheat production of Pakistan reached 26.3 million tons.[v] In addition, the country harvested more than 25 to 23 million tons of wheat in 2012.

Except in several years when its harvest is unfavorably affected by droughts, Pakistan is a net food exporter. Pakistan exports rice, cotton, fish, fruits (especially Oranges and Mangoes), and vegetables and imports vegetable oil, wheat, pulses and consumer foods.[vi]

The cause of the locust plague in Pakistan

In remote areas near Yemen, Oman and Saudi Arabia, due to the stimulation of heavy rains, unprecedented reproduction of desert locusts was observed in 2018. This phenomenon provoked vast swarms of desert locusts which struck South West Iran in late January and February in 2019. In March 2019, the northeast of Saudi Arabia reproduced exceptionally well in spring and spring, and another group of locusts was added, which further encouraged the increase in the number of locusts in Iran. [vii]In most cases, desert locusts reproduce in southeastern Iran every spring, but this year's reproduction started a month ago, which leads to the spread of locusts in Iran. Despite Iran's large-scale control campaign, some uncontrolled and undetected locust populations migrated to Baluchistan in Pakistan during March

2019. Unfortunately, in Balochistan province, due to the rainfall, climatic conditions are conducive to the reproduction of locusts [viii]

The swarm moved from South Africa to East Asia, Pakistan along the way, which is one of the destinations. Initially, the Ministry of Food Security and Research of Pakistan had controlled the locust plague and protected many cash crops. However, by 2020, due to the increase in rainfall in the desert areas of Pakistan, it will provide a good living environment for the desert locusts, which will further aggravate the locust disaster and triggers huge losses in agriculture. 38% of Pakistan's land is suitable for locust breeding, and Pakistan is one of the few countries in the world that has two locust breeding periods a year.

Negative influence & s of locust in Pakistan

Under the influence of the coronavirus pandemic, Pakistan is still stumbling. At this time, another serious crisis is staring at Pakistan, which may affect its food security. Locusts (short-horned grasshoppers) invaded the agricultural fields of the two countries in groups, causing crop failures and famines in the area. These insects mainly come from the desert, and they can eat anything from bark to seeds and flowers while traveling at speeds of up to 93.2 miles (149 kilometers).[ix]

Figure 1[1] locust vulnerable districts

Desert locust swarms can reach 460 square miles in size and can shelter 40 to 80 million locusts in less than half a square mile. [x]Each locust can eat as many plants as its own weight,

so a large swarm of locusts will eat 423 million pounds of plants every day. In short, a swarm the size of Paris can eat half the food of the French population in one day.[xi]

The plague of locusts is immense. For a country where agriculture accounts for 20% of its GDP and its population accounts for 65% of its total agricultural population, it will cause catastrophic economic damage. The locust damage may reduce Pakistan's economic growth to less than 2% in the fiscal year that ends in June. Winter crops such as wheat in Pakistan will lose about 2 billion pounds, and the summer crops now sown will further lose 2.3 billion pounds. Pakistan is also already suffering from severe inflation, which is now the highest in 12 years, with the cost of sugar nearly doubling and the cost of flour, vegetables rising 15% this year.[xii] The coronavirus pandemic has also placed an unprecedented economic burden on the country. Combining all these challenges, the infestation of locusts may even make basic staple food unaffordable.

Prevention & controlling solutions

Present Solutions

1. ELocust3

ELocust3 is an efficient data recording and transmission system for crop pests and diseases monitoring. The innovative technologies developed by the Food and Agriculture Organization of the United Nations and its partners are helping to improve early warning by quickly discovering locust outbreaks and green vegetation that may become locust infestations.

ELocust3 was released in 2014 and is a proven data recording and transmission system suitable for difficult and remote areas with difficult monitoring. The device consists of a rugged tablet computer and custom-designed software that enables field staff to collect data and transmit it via satellite in real time from the field to its National Locust Center, and then to FAO's Desert Locust Information Service (DLIS) Rome headquarters. [xiv]ELocust3 is the latest update of the eLocust series, which has proven effective for early warning and prevention and control of locust-affected countries.

The information obtained through eLocust3 can be used to assess current conditions, predict the development of locust swarms, and warn countries and international donors affected by locusts to prevent possible locust invasions and plagues. The device is designed to be used in areas where there is no Internet connection, and is suitable for monitoring large-scale inaccessible areas. The navigation function allows the locust survey and control team to

determine and find ways to green vegetation and potential locust infestation areas. The tool is based on new advances in technology, and can be adjusted and replicated according to other migrating or sedentary crop pests and diseases, so as to monitor the level of pests and diseases and control them in a better timed manner as needed[xv].

2.
Drones

Drones are suitable for remote areas to check for pests and search for green areas (main foraging grounds for locusts) in large arid areas.

Rotor and fixed-wing drones are two types of drones that have been tested and useful. Rotor drones can hover long enough to take detailed images. On-site personnel can stand nearby and analyze the locust density in real time. However, the range of rotating drones is limited. On the other hand, a fixed-wing UAV can cover 100 kilometers in one flight, which makes it an ideal choice for finding green vegetation in the vast desert.

3.
Satellites

First, use satellite-collected data to extend the model of projecting locust flight paths. This allows forecasters to better understand the origin of the group and where they are heading in the next few days, especially since the group can travel 150 kilometers per day.[xvi]

Satellite images can help experts understand where it rains, vegetation growth, and possible favorable breeding conditions in order to predict pest threats. Vegetation refers to the food and shelter of locusts. Therefore, the daily changes of each map will be thoroughly checked, and the appearance of the smallest hint of green may trap the on-site personnel in the heat wave of locusts. More importantly, satellite imaging can penetrate dry topsoil to find moisture below-the ideal condition for spawning.

Individually proposed solutions

1. Hopper bands

Just like adult locusts in groups, under the right conditions, hoppers will stop acting like individuals and line up in a 5 km wide strip of predation. PAN restored the isolation behavior of insects. Some people feel confused and disoriented, lose their appetite, while others become cannibals and eat each other. Any survivor is an easy prey for carnivores.[xvii]

What makes PAN particularly attractive is that the required dose is only a small fraction of the amount of chemical or biological pesticides (usually less than 10 ml per hectare). This means that the cost is greatly

reduced, 50 cents per hectare, while12 dollars for chemical pesticides, and 15-20 dollars for other biological control agents. This is clearly the main consideration for first-tier countries-many of them are the poorest in the world.

2. Biological control

Biological control measures considered to be completely green and non-toxic and harmless include natural predators such as wasps, birds and reptiles. More specifically, swallow plovers and frogs are two of locusts' most widely known predators. In locust-affected areas, high-efficiency and low-toxic agricultural and biological pesticides are used to protect predatory natural enemies in locust areas. Poultry such as chickens, ducks and geese can also be stocked on the hillside for prevention. These predators may prove to be effective in deterring small swarms.

However, for managing more established swarms, newly-developed targeted microbial biopesticides, such as the fungus-based "Green Muscle", offer a larger scale solution. Compared to expensive pesticides which break down within 1 day, biopesticides that consist of spores of the fungus, which produces a toxin that kills only locusts and related grasshoppers is cheaper, more effective, longer lasting in the desert, and easier to store.[xviii]

A class of products called Insect Growth Regulators (IGR) has also been used by modern locust fighter armouries. These products affect the locust's ability to molt and grow normally. They have no direct toxic effects on vertebrates.

IGR is effective within a few weeks after administration and can be used for so-called barrier therapy. In this method, only narrow strips of product are applied, perpendicular to the direction of the traveling hopper belt. Only 10% of the blanket processing volume is required. After crossing one or two obstacles, the hopper will absorb enough products and die during moulting.

As with PAN and Green Muscle, however, IGRs need to be aimed at locusts at an early stage in their lives, before they take to the air. That, in turn, requires an advanced level of surveillance and intelligence- gathering to make sure that any locust concentrations are nipped in the bud.

3. Incentive policies of hunting locusts

Local governments can use incentive policies to not only control the locust plague but also offer subsidies to the infected rural families.

For example, the local government can pay farmers to bag the locusts for chicken food. Collectors should be trained on the best methods to catch the locusts, which is at night when they cluster to trees.

However, the funds given to the farmers can be a problem since the locust plague has already damaged the economy income of the province.

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