Damage Evaluation based on LULC Change Detection

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ABSTRACT

It is of great importance to being able to compensate those who suffered damages as a result of a natural or other disasters. In most cases, the compensation is a result of an insurance policy actually signed and agreed upon between an individual or a legal entity and an insurance company. In special cases, the state compensates the citizens for the damage caused to them. One of the most important aspects in such events is the speed with which the system can intervene, assess the damage and compensate those who were damaged. A healthy society makes sure to compensate its citizens on time. In fact, timely compensation can be the difference between improving the situation or losing control over the incident. This can worsen the situation into a point where the damaged party find it impossible to recover.

This article describes a project focused on developing a method and a working system to simplify the assessment of damages caused to agricultural crops. This, whether by natural or other disasters. The background for this work was damages caused to agricultural areas following hostilities and especially in events where human evaluators were denied access to the affected area.

Detection and identifying changes in Land Use and especially in Land Cover are a well-known tool for monitoring events as well as a basis for future strategic planning. We have used these capabilities for many years to maintain an ongoing incremental updates of our spatial databases. In a country like Israel, the factual accuracy and up-to-date spatial information are of great importance. This, as many of our defense and planning systems were based on the national spatial information system maintained by the Survey of Israel For example, we use as much up-to-date information as possible to base the decisions of the operators of the Iron Dome defense systems. Even in day-to-day life, all government ministries are obliged to conduct planning operations based on the national spatial database. Thus, this topic of LULC change detection for updating spatial databases has been addressed by several major research efforts.

Recently, a more specific need arose in the demand to examine the possibility of assessing damages caused by natural and other disasters that our country is also affected by. This is no small problem in a country where there are many cases of man-made forest fires, to name one. In addition, during the last 5 years there have been many cases of fields being burned by incendiary balloons carried by the wind from sources outside the country. Over the years, there have been many cases of damage caused to crops in militarily dangerous areas. In these cases, the assessors sent by the government or private insurance companies could not even reach the affected area for long time. This caused more damage to the civilians who had already suffered from these damages. These additional challenges turned a sort of "simple" task into a long-term challenge. The article will present a proposed solution based on detection of changes in Land Cover. Specifically, the solution is based on crop yield prediction carried out in areas where changes in Land Cover were found. The ability to predict crop yield was already proven by us back in 2000 and is maintained as an active service for farmers. The service also includes an assessment of the amounts of fertilization provided to the growth. This, in itself, brings many times, cut in expenses. Today, when data collection is easily obtained with the help of photography using drones, the operation is even easier. What's more, we base this on photographic systems in the visible range of the spectrum. This also allow the use of cheap and affordable systems. The photography done this way makes it possible to do it even from a distance and without risking people. It offers one may carry the data collection close to the event. Thus, the process of assessing the damage and the appropriate compensation may be carried out quickly enabling the granting the needed appropriate aid in a short time. All of the above explains the motivation for the project, which began in January 2023. At first it began with monitoring crop cycles as the basis for comparison. Later, the mission evolved to assess the effects of natural disasters over the specific crop types to be monitored. This was to support, as requested, the damage assessment and to assess and resolve disputes regarding the way the government should assist farmers whose fields were affected by the disasters. There was also hope that remote system activation might speed up the process. This, especially in cases of where the appraisers were unable to reach the area. Indeed, as we can show, we found that the system produces relatively quick results, without endangering people in areas that are still at risk.

Fig 1. A hummus field in Kibbutz Gevimm partially burned from incendiary balloons in 2021.

Fig 2. Mega Fire in Nature Reserve near Haifa and Zebulun Valley fields near Acre in 2016. NASA satellite image (Photo: AP)