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## Factors controlling gully erosion development in Toroud basin - Iran

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### Abstract

Gully erosion, is often associated as one of the most severe forms of soil erosion processes. And often results in much displacement of the soil mass, culminating in sedimentation, and degradation of the land. Gully erosion has tremendous impacts on human activities which includes decreasing soil nutrients and agriculture productivity, river channel sedimentation and increasing floods and impact on water resources development within a river basin. Considering the challenges faced in semiarid regions, this research tries to evaluate all the factors controlling gully erosion in Toroud basin that there is no comprehensive study on this gully and basin. In order to achieve this goal and providing greater assistance for obtaining all the elements to stop gully erosion expansion, the research examines two major objectives, which focuses on the formation of gully erosion and the short term or long term approach in the extension of gully erosion in Toroud basin- Iran. This research is using software of Ilwis in GIS for preparing the maps and Excel for preparing the graphs. By considering the importance of the subjects and with regard to the fact that studied region contains large and extensive gully which introduces potential hazards for croplands and habitats, and also make it difficult to pass through them, it is required to perform all possible actions which lead to bring an end to the development and expansion of gullies.

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*Keywords:* Gully erosion; formation; expansion; control.

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**1. Introduction**

Gullies are watercourses marked by steep channel walls, a stepped longitudinal profile, and commonly an abrupt channel head. Gully erosion is an important form of erosion and gradually draws more and more attention from researchers in recent years. During the past twenty years, many researches of water erosion mainly paid attention to the process of gully erosion which they exist in many settings; they are prevalent in dry lands and are often considered a signal of disturbance and accelerated erosion by climate or land-use change (Morgan, 1995).

Also Gullies may be initiated and commence in three ways; by linear landslide, surface flow or piping. Gully erosion is a serious Geo-environmental issue in most Middle Eastern countries including Iran. Erosion by gullies can be an acute problem causing high sediment yield, removal of fertile soil, destabilization of hill slopes, and the lowering of water tables in alluvial aquifers (Patton & Schumm, 1975).

Gully erosion in Toroud basin has created big problems and has had many negative effects on human life. Also, gully erosion is the cause of hardship in passing through the land and every year there are many soil erosions and soil carryings and sediment productions and it is a serious threat to surrounding lands and areas.

There are some theories on formation of gully erosion by several researchers (NSW Soil Conservation Service 1986; Gomez et al, 2011; Jianrong et al., 2008; Hudson, 1985; Joel et al., 2003; Morgan, 1995; FAO, 2012; C. J. Francis).

According to the theories, the following diagram, fig. 1, is showing how gully erosions form, extend and abrupt during the time in many places, and some places do not follow this way and a huge gully can occur during just some hours of heavy rainfall and flood.

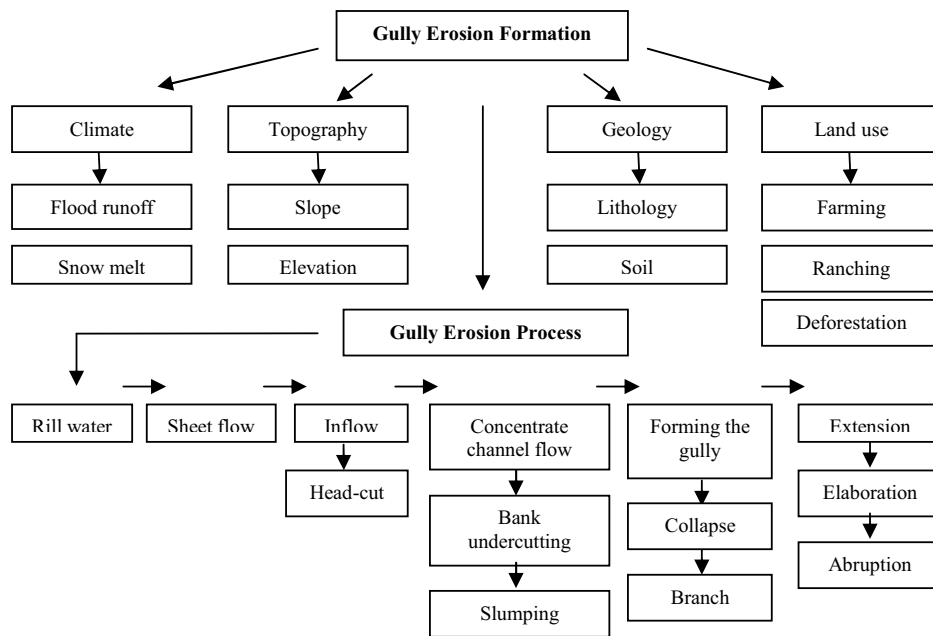


Fig. 1. Gully erosion formation and process

**2. Material and Method**

Toroud basin is located at 35, 47, 45 north latitude and 52, 53, 35 east longitude in Semnan state and northeast of Tehran in Iran. The surface area is approximately 874.5 hectares. And according to the maps prepared by GPS in 2008, the surface of gully erosion in this basin is about 97.25 hectares.

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