



A Study of the Formation of Alluvial Fans

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Introduction:

The term “Fan” was first time coined by Haast in his work about Canterbury Plains on 1864. He consider that these plains were fan shaped developed by the depositional work from the Pleistocene Glaciers. After a century (1964) Carryer put out the concept that the Alluvial fans are formed in the foothill zone produced by the depositional work by river or water. “Alluvial fans and Cones due accumulation of materials are always fanned at the base of foothills where there is abrupt drop (decrease) in the channel gradient.” (Savindar Singh). “An alluvial fan is a body of sediment whose surface form approximates to the segments of a cone which radiates down slope from a point on a mountain front, usally where a stream emerges.” (Michael A Summerfield).

Key words: Alluvial Plan, Alluvial Cone, Apex, Apron, Shelf Regularity Nature, Nested Hierarchical Arrangement, Sediment routing system

Definition: Alluvial fan and alluvial cone are the most significant features produced by the moving water in the confluence of steep and relatively smooth slope formed by the deposition of gravels, sand, and mud.

Characteristics:

Geomorphologist Michael A Summerfield, Savindar Singh characterized alluvial fan as bellow -

1. Generally alluvial fan has a radius of less than 8km but in some certain condition it may exceed up to 100 km.
2. Alluvial fans are form concave-up long profiles but convex-up cross profiles.
3. Mean slope generally ranges from 1° to 5°. But sometimes the apex zones may carry the slope more than 10°.



Fig: 1. Aerial view of alluvial fan at Badwater, Death Valley National Park, California. (9A89-21; Dep-03), Image Source : <https://geologypics.com/alluvial-fan-death-valley-ca-4/>

Formation:

Post modern Geomorphoigis believes that landforms determine itself that how to the geomorphological process act on the landform. The components that regulate the process are slope and height or elevation. It is not necessary that a river or stream can produce the alluvial cone or fan. A gully or rill also can produce the alluvial cone of fan. Because of the Shelf Regularity Nature of each micro basin. It is also remark that in a macro, meso and micro river basin developed a hierarchical arrangement in to a macro river basin that called Nested Hierarchical Arrangement.

Stanley Schumm (1977) provided a useful framework for unraveling sediment routing based on terrestrial sediment deposition system classified into three zones. First one is Force Zone, that zone may be defined as the erosion engine of a sediment routing system. This zone is characterized by high relief and the zone where the sediment and dissolved solutes are produced. Second zone is Transfer Zone. This zone is the transformation zone of sediment through various processes. And the third of final phase is the Sink Zone. It is the zone of final deposition.

Alluvial fan and cones are formed by streams emerging from uplands into a plain or wide valley floor. Along the upland course of a river or stream or blowing water mass it erodes the surface (Force Zone). And transfer the materials through Transfer Zone. When a rapid change of slope occurred in landscape the materials deposited shaped like fan. This land form is known as alluvial fan. Alluvial fan is also known as Bajada in Terai Region in India.

Anatomy of Alluvial Fan:

An alluvial fan has two major components. One is Apex and the second one is Apron. Apex is the zone towards steep slope and apron is the zone towards plain. (Fig – 1) The most significant character of Apex is developed by coarse materials but the Apron is developed by relatively smooth materials.

Difference between Alluvial Fan and Cone:

Structure of Alluvial Cone is coarse but the Fan is smooth. Alluvial cone developed near the foothill because the heavy materials cannot be transported through long distance. In the other hand the alluvial fans are developed far from the foot hill because the sediment, sand etc can easily transported far by the moving water.



Fig – 2 Alluvial Cone (1st Image) and Alluvial Cone developed in the bank of Cossai River, Midnapore, West Bengal

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