

## Mitigation of Flash Flood using Permaculture System Developments in the Watershed (Case Study: Vardige region, Tehran, Iran)


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Mitigation of flash floods is possible using different structural and nonstructural methods, and mitigation of runoff in the watershed is the first step. In the other hand, by growing population, farmlands and water harvesting are increasing and it would have disastrous circumstances. Development of permaculture systems in the watershed area can improve water harvesting and reduce disaster risk by detention of water on the upstream. Also, by planting fruit species and development of the agroecosystem, permanent agriculture will develop and food security will be realized too. This contribution shows some success experiments on the development of permaculture plans on the Vardige watershed that is located in Tehran city to mitigate flash floods using ponds and underground dams and manage the water harvesting through development of vegetables, fisheries, poultry and beekeeping in different zones of the basin.



## Mitigation of Flash Flood using Permaculture System Developments in the Watershed

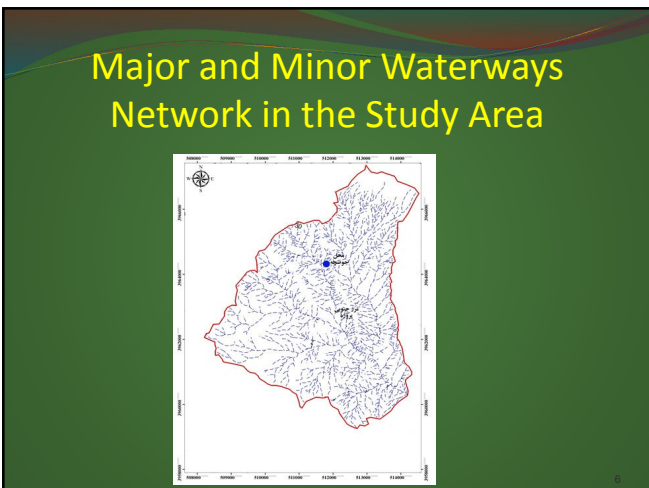
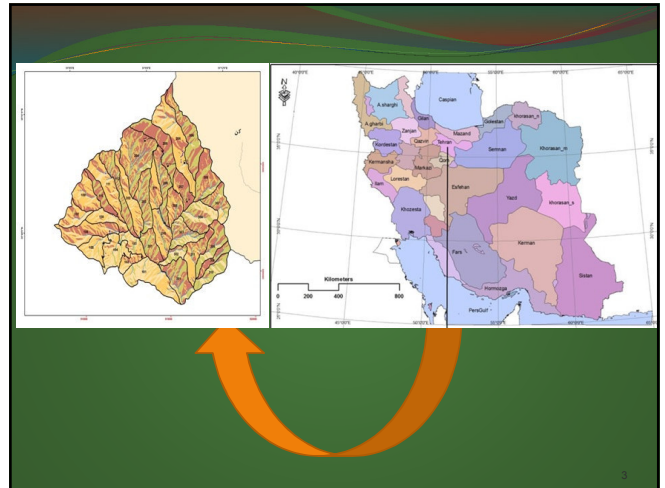
(Case Study: Vardige region, Tehran, Iran)

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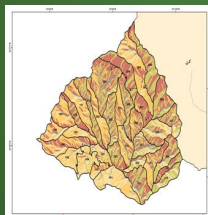
### Purpose

- Mitigation of flash flood
- Development of permanent agriculture system
- Assess the establishment of seedlings and dibbling of years ago
- Optimal utilization of the potential and capabilities watershed
- Reduce irrigation costs due to the watershed potential
- The effect of super absorbent, on the attraction and retention of moisture in the soil



### The Introduction of Regional

Vardij watershed, is located in the most western part of the southern slopes plan of Alborz Mountains as a zone of conservation and restoration of natural resources.



- Q(Av): 8.93 m<sup>3</sup>/s
- A: 6093 Ha
- El (min): 1381
- El (max): 2891
- P: 330 mm



### Hydrologic Parameters

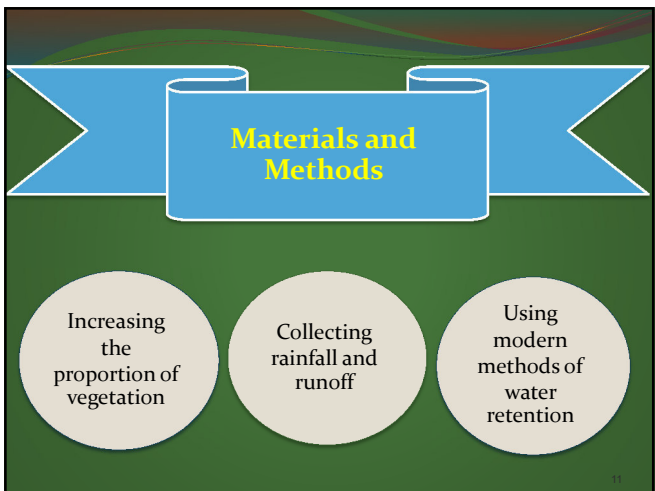
Watershed	CN	S (mm)	A (km <sup>2</sup> )	Travel time	Time of concentration	Time of peak
Vardij	79.03	67.4	60.93	126.8	121.2	83.7

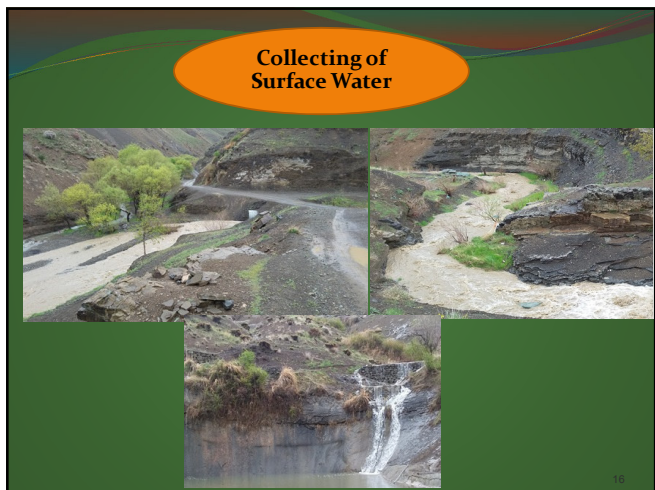
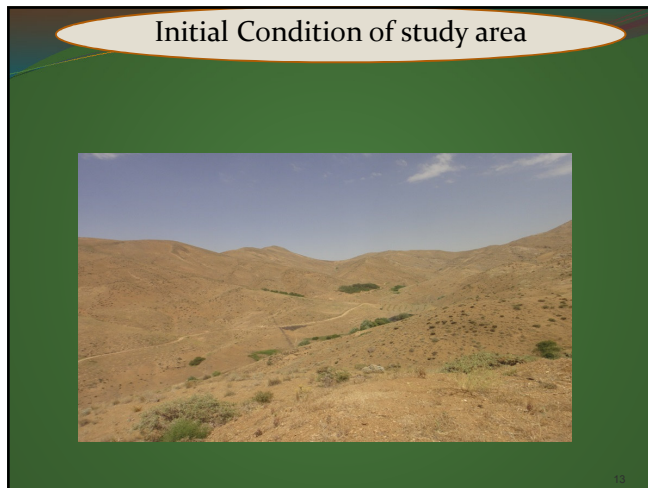
  

Methods	The return period of maximum runoff					
	2	5	10	25	50	100
SCS	0.96	9.08	18.9	33.55	39.87	46.6
CIA	36.97	54.02	67.82	89.81	107.25	125.53

Source: Razmjoui, N. et al. 2013

- ### Executive Operations
- Survey of regional topography and the initial conditions
  - Collecting precipitation and storage of surface water
  - Biological operations
  - Using the new technology for water retention
  - The creation of water storage tanks
  - Participation action plan
  - Expertise inspections
  - Operational issues





Create dewatering system



Performance of Bankette



The use of new technology for water retention

The use of superabsorbent

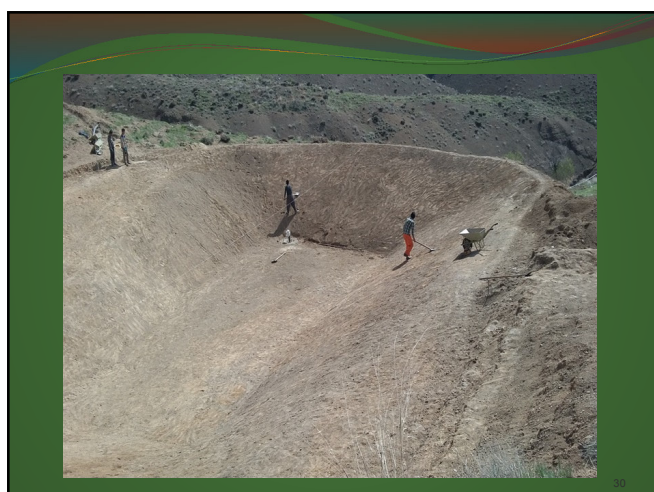
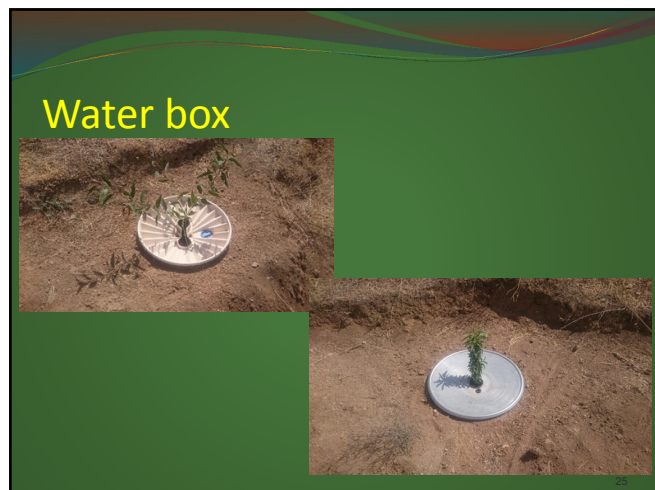


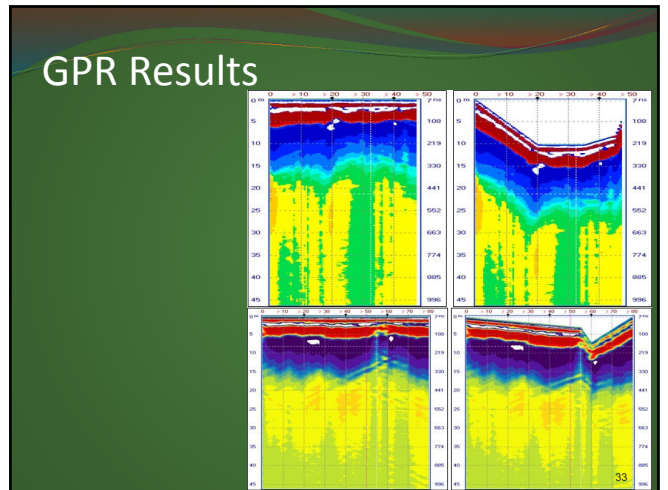
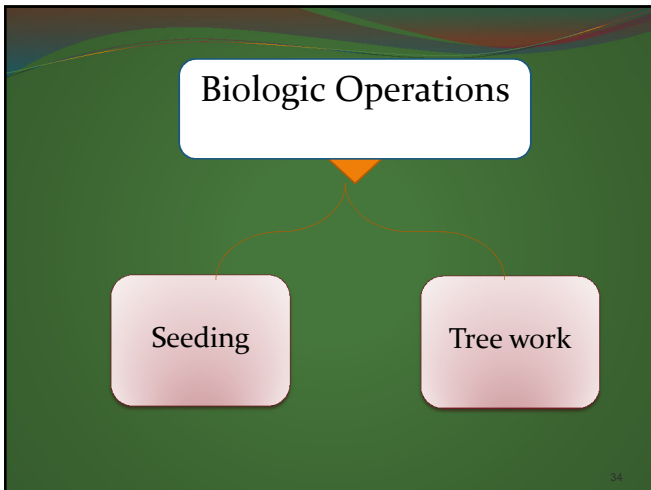
Use pipes



The use of nylon in the pan hole







Scientific name	Species	Persian name
<i>Thuja orientalis</i>	سرو	سرو خمرد ای
<i>Morus alba</i>	موراسه	توت سفید
<i>Ailanthus altissima</i>	سیمور باسه	عرعر
<i>Cercis siliquastrum</i>	یاقلاسانان	ارغوان
<i>Hippophae rhamnoides</i>	سنجدیان	سنجد تلخ
<i>juglans</i>	گردویان	گردو
<i>ficus</i>	موراسه	انجیر
<i>vinifera</i>	انگوریان	انگور
<i>pyracantha</i>	گل سرخیان	خار مصری
<i>Cupressus arizonica</i>	سرو	سرو نقره ای

### List of grown seedlings

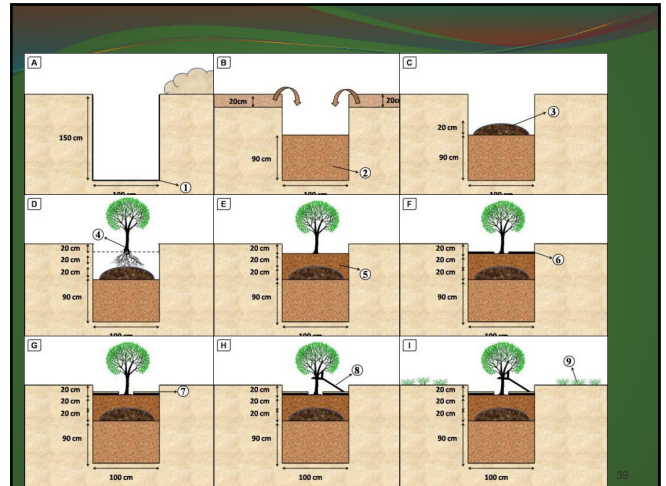
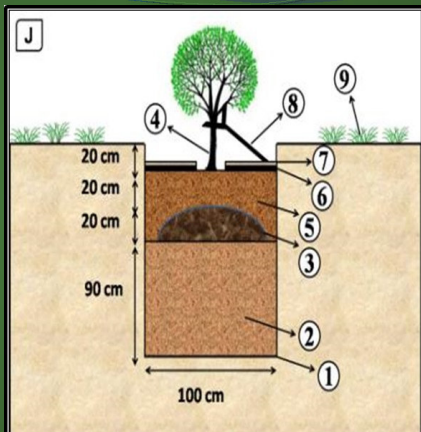
Scientific name	Species	Persian name
<i>Amygdalus lycioides</i>	گل سرخیان	تنگرس
<i>Pistacia atlantica</i>	پسته ایان	بنه
<i>Celtis caucasica</i>	شاهدانگان	داغداغان
<i>Cerasus microcarpa</i>	گل سرخیان	راناس
<i>Pinus nigra</i>	کاجیان	کاج سیاه
<i>Berberis vulgaris</i>		زرشک
<i>Cotoneaster nummularia</i>	گل سرخیان	شیرخشت رونده
<i>Cotoneaster nummularioides</i>	گل سرخیان	شیرخشت
<i>Amygdalus orientalis</i>	گل سرخیان	ارژن
<i>Elaeagnus angustifolia</i>	سنجدیان	سنجد

## Plant nursery



Scientific name	Species	Persian name
<i>Amygdalus scoparia</i>	گل سرخیان	بادام
<i>Fraxinus</i>	نعناسانان	زبان گنجشک
<i>aspira</i>		اسپیرا
<i>acaci</i>	باقلابیان	اقاقیا
<i>olive</i>	نعناسانان	زیتون
<i>pinus</i>	کاجیان	کاج تهران
<i>Vetiver</i>	گراسها	وتنیور
<i>persimmon</i>	خرمائیان	خرمالو
<i>cypress</i>	سرو	سرو شیراز
<i>Quercus</i>	راش سانان	بلوط
<i>atriplex</i>	تاج خروسان	آتربلیکس
<i>rosa</i>	گل سرخ	گل رز

Description Pattern:  
 1-drill holes for transplanting of seedlings  
 2-layer of fertile soil + straw  
 3-layer cone, fertile soil + manure  
 4-seedlings (indigenous)  
 5-layer of fertile soil  
 6-covered insulation (insulation and nylon lesions)  
 7-layer thin soil  
 8-guardian  
 9-protection humid microclimate



## Seeds list

Scientific name	Species	Persian name
<i>Amygdalus scoparia</i>	گل سرخیان	بادام
<i>Amygdalus lycioides</i>	گل سرخیان	تنگرس
<i>Amygdalus orientalis</i>	گل سرخیان	ارژن
<i>Amygdalus Arabica</i>	گل سرخیان	وامچک

## Seedling

- The minimum depth of 30 cm hole for seeding
- Seed at a depth of about 3 times the diameter of the seed to be planted
- The number of seeds per hole, according to viability is determined
- All seeds are treated before planting
- The use of superabsorbent materials as well as fertilizers in all holes





### Pasture and grass seeds

Scientific name	Persian name
Achillea millefolium	بومادران
Rhus coriria	سماق
Prangos Ferulaceae	جاشیر
Brassica nigra	خردل سیاه
Rheum	ریواس
Dorema aucheri	بیلپر
Allium hirtifolium	موسیر
Althaea officinalis	گل ختی
Angolata Frulago	چویر
smyrnum	بینامه (اوندل)
Curcus sativus	بزعفران



