

# AMIES II – Midterm Meeting

Giessen, Rauschholzhausen in May 2016



Scenario Development for Sustainable Land Use  
in the Greater Caucasus, Georgia

## Maia Akhalkatsi

### AMIES II –G2: Agrobiodiversity and Genetic Erosion of Crop Varieties and Plant Resources in the Central Great Caucasus



Center for  
International Development  
and Environmental  
Research



Ivane Javakhishvili  
Tbilisi State  
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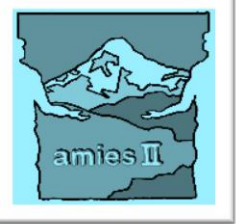


Ilia State  
University



Agricultural  
University  
of Georgia





# Genetic Erosion of Crop Varieties

Study site is located at Kazbegi Municipality and located in the Central Great Caucasus at an altitude between 1250 and 5047 m a.s.l.

Mt. Kazbegi 5033 m

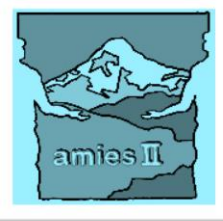




# Genetic Erosion of Crop Varieties

Agriculture of this area is extreme internal variability and complexity, with a multiplicity of highly localized providing the habitats and agricultural lands for much genetic erosion of crop varieties, animals, plants, fungi, and other life forms for wild plant resources.





# Genetic Erosion of Crop Varieties

## History of Agriculture of Georgia

The ancient findings from Neolithic period of cereal grains in Georgia were discovered:

1. Trialeti Range, Tsalka district;
2. Kvemo Kartli region: Arukhlo and Shulaveri excavations, Dmanisi and Bolnisi districts;
3. Samegrelo region: Dikha-Gudzuba and Nokalakevi;
- 4.. Imereti Region, Dzudzuana cave;
5. Kakheti, Nelkarisi.



Fig. 1. Map of Georgia. The administrative regions: 1. Abkhazia; 2. Samegrelo-Upper Svaneti; 3. Guria; 4. Adjara; 5. Racha-Lechkhumi; 6. Imereti; 7. Meskheta- Javakheti; 8. Shida Kartli; 9. Kvemo Kartli; 10. Mtskheta-Mtianeti; 11. Kakheti. The places of archaeological excavations are indicated: Dikha-Gudzuba, Nokalakevi, Dzudzuana cave, Arukhlo, Dmanisi and Shulaveri.



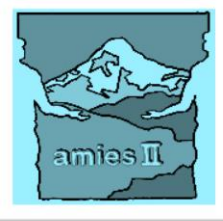


# Genetic Erosion of Crop Varieties

## Crops of the Neolithic period

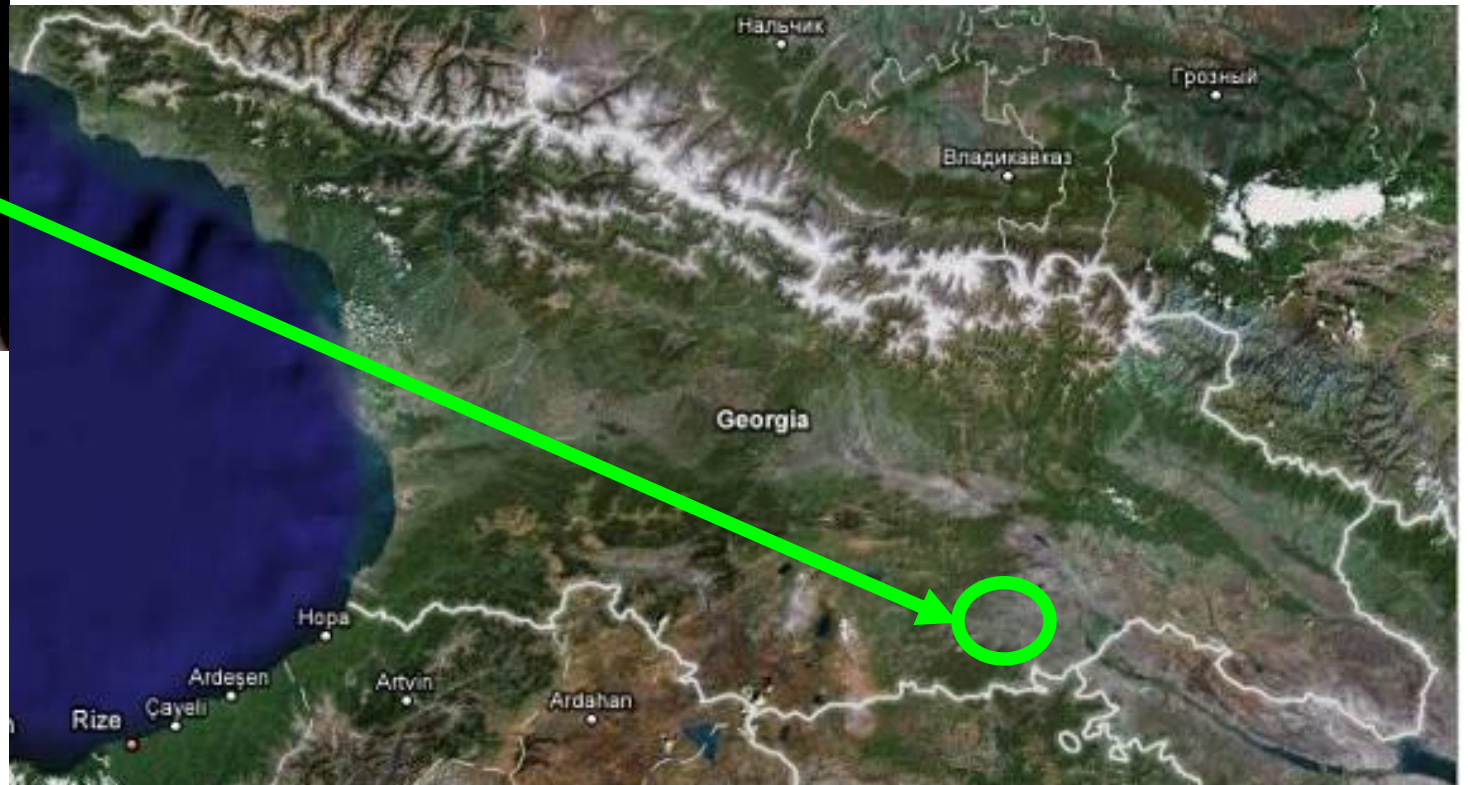
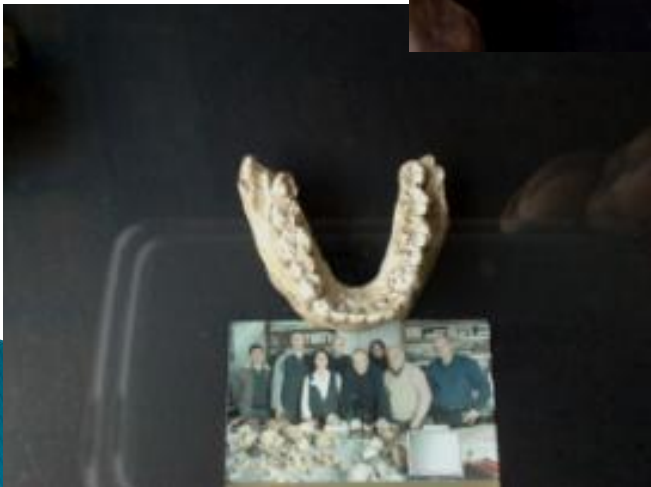
- The following crops were found in these archaeological excavations:
- Seven species of cultivated wheat - *Triticum aestivum*, *T. spelta*, *T. carthlicum*, *T. macha*, *T. monococcum*, *T. dicoccum*, *T. compactum* and one wild relative *Aegilops cylindrica*.
- Other cereals: millet - *Panicum milleaceum*, barley - *Hordeum vulgare*, Italian millet - *Setaria italica*, oats - *Avena sativa*, wild lentil - *Lens ervoides* and pea - *Pisum sativum*.
- Grapevine, fruits: pear, plum, cherry etc.





# Genetic Erosion of Crop Varieties

The 1.7-Myr-old specimens of small-brained hominids (*Homo erectus*) are found in the Caucasus at Dmanisi, located in Southern Georgia



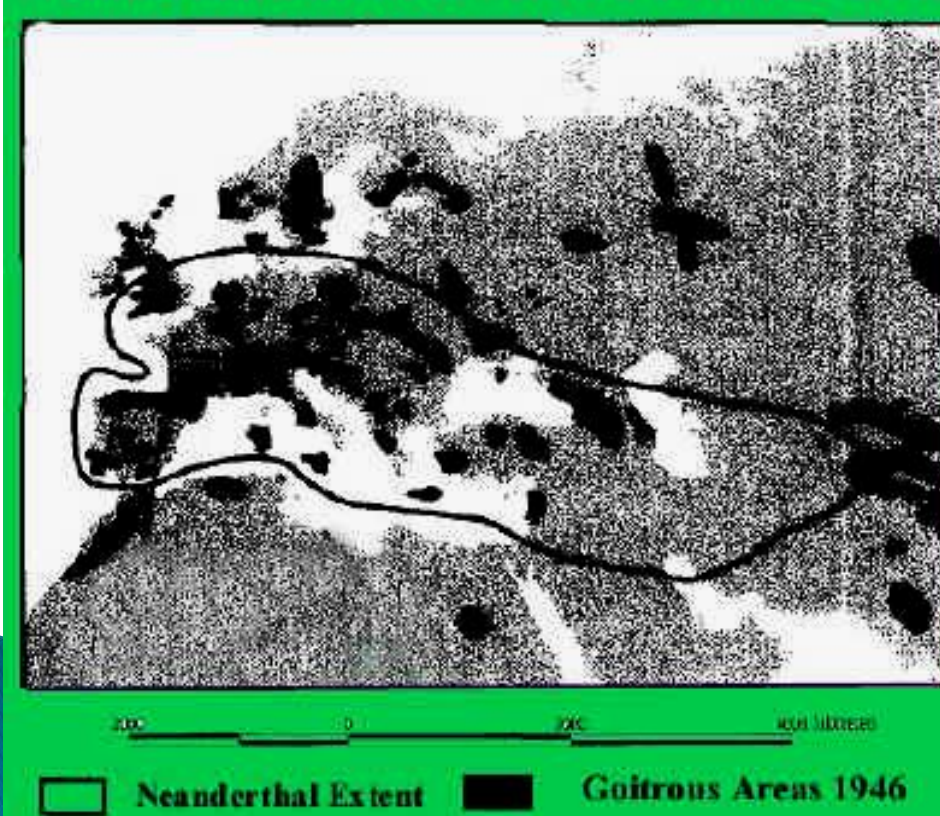




# Genetic Erosion of Crop Varieties

*Homo neanderthalensis* invaded the Caucasus region at an unknown time and the final replacement of them by modern humans - *Homo sapiens* might be occurred here ~28 Ka BP.

Neanderthal Burials & Modern Goitrous Areas





# Genetic Erosion of Crop Varieties

Historically, Kazbegi producers had begun cultivating the land to prepare for planting in of distribution local varieties of wheat, barley, rye, oats, etc. In the only cereals, legumes, herbs and some fruits are cultivated in alpine zone as the upper limit till the location of 2160 m a.s.l.



Cereals remained in empty villages



Akaki Avsajanashvili



*H. vulgare*  
var. *nigrum*



*Hordeum vulgare*  
var. *nutans*



# Genetic Erosion of Crop Varieties

Local cultivars of barley, wheat and rye were before distributed up to 2100 m a.s.l. in all high mountain areas and used as beer:

1. *Hordeum vulgare* var. *nutans* 'Akhaltesli',
2. *H. vulgare* var. *nigrum* 'Dzveltesli shavpkha',
3. *H. vulgare* var. *nudum* 'Kershveli',
4. *Secale cereale*
5. *Triticum durum* var. *apulicum*, 'Shavpkha'
6. *T. durum* var. *leucurum*, 'Shavpkha'
7. *T. durum* var. *murciense*, 'Shavpkha'
8. *T. carthlicum* var. *fuliginosum*, 'Dika',
9. *T. carthlicum* var. *rubiginosum*, 'Dika',
10. *T. carthlicum* var. *stramineum*, 'Dika',



*T. carthlicum* var. *fuliginosum*



*T. carthlicum* var. *stramineum*





# Genetic Erosion of Crop Varieties

Genetic erosion has been determined historically of aboriginal crops from sheep and cattle grazing problem and reached extreme levels from 1970s in Kazbegi Municipality and causes a problem to maintain agriculture.







# Genetic Erosion of Crop Varieties

Other varieties are in village yard



Potatoes



Herbs



Vegetables



*Allium fistulosum* L.



*Allium victorialis* L.



*Allium ampeloprasum*



# Genetic Erosion of Crop Varieties

Plant resources remained in forests and subalpine grasslands and shrub lands.







# Genetic Erosion of Crop Varieties

## Habitat type and description of existing disturbances

Relatively stable or undisturbed communities. Example: old growth, ungrazed forest.

Late successional or lightly disturbed communities. Example: old growth forest that was selectively logged in recent years.

Mid-successional or moderately to heavily disturbed communities. Example: young to mature secondgrowth forest.

Early successional or severely disturbed communities. Example: severely grazed forest of any age.

Very early successional or very severely disturbed communities. Example: cropland





# Genetic Erosion of Crop Varieties

The problems of these materials are habitat degradation by disturbance in many forest types with destroyed and burned.

## Why should protect the habitat?

**Landowner's interest is to preserve and develop natural resources in order to maintain the environment of wild species.**

**The increase of plant and animal populations of wild species allows it to extract natural resources in health care, for example. food and medicinal plant collection and hunting animals.**

**Protection of plant and animal species for food and multiplication, for example, plants for planting, seeding, disease protection, etc.**

**Protection of vegetation cover, for example, soil erosion, reduce the influence of climate change, vegetation replaced by those of recovery, etc.**





# Genetic Erosion of Crop Varieties

## Habitat degradation, fragmentation and loss

**Habitat degradation is connected to biodiversity loss factors as a result of the reduction depends on the species.**

**Habitat fragmentation affects pollination between plant species and animal species restriction area**

**Habitat loss depends on species extinction rates in the past and the future of the likely range of speeds**

**Restoration of degraded habitat has vegetational fluctuation impact on biodiversity: pioneer species → climax species**





# Genetic Erosion of Crop Varieties

## Habitat Degradation, Fragmentation And Loss

Habitat degradation is leading to the reduction of biodiversity. by loss of species depended on the causative factors

Habitat fragmentation affects on plant species pollination and restrictions of animal species location areas.

Habitat loss depends on the speed of species extraction in the past and the alleged speed in the future.

Restoration of degraded habitat has succession impact on biodiversity: a pioneer species to climax species.





# Genetic Erosion of Crop Varieties

## Habitat threats

Natural hazards cause the extinction of species and mutational changes.

Habitat damages cause the reproductive and geographical isolation of species.

Global cataclysms represent threats for species extinction.

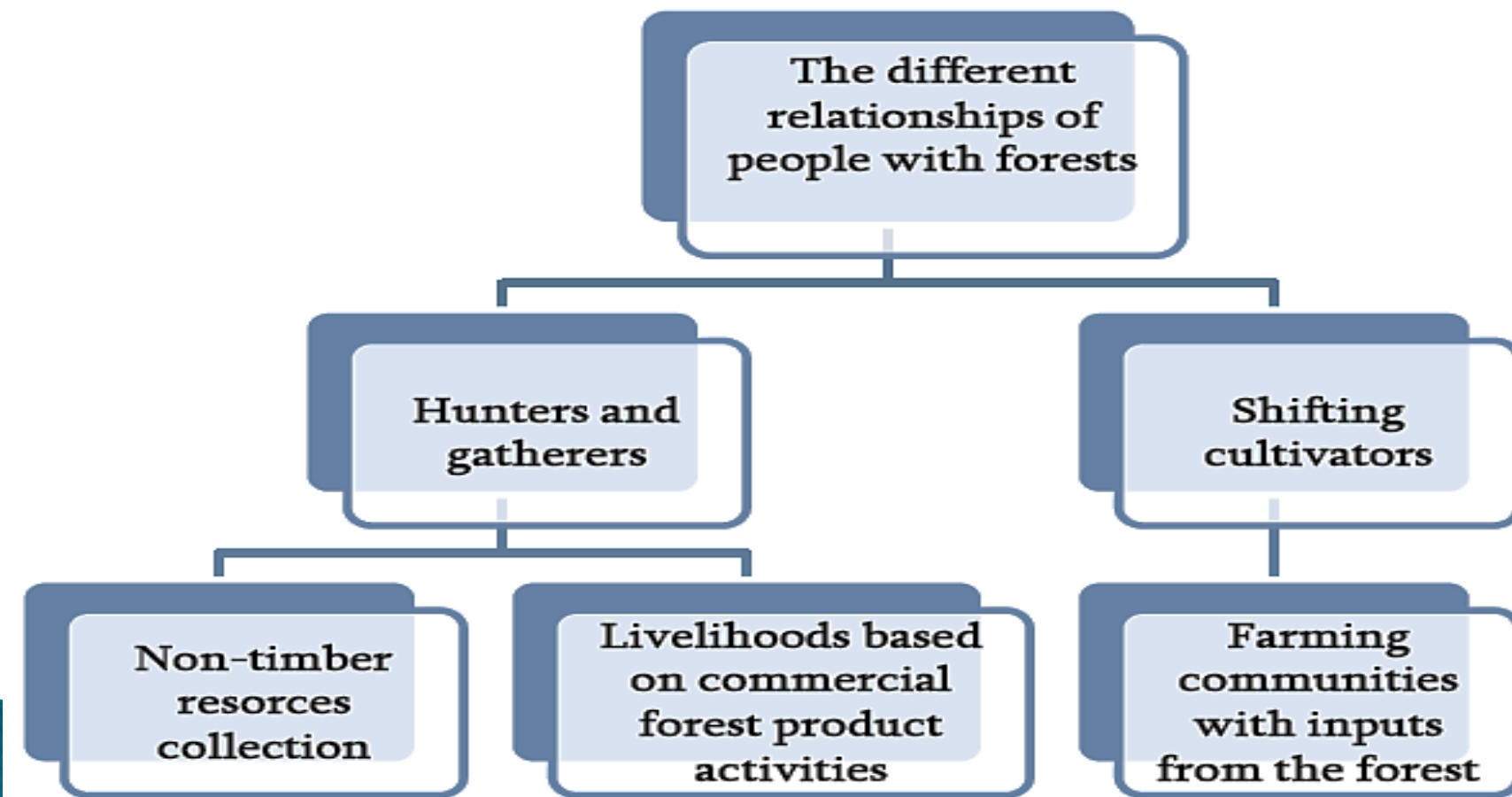
Habitat destruction is caused by human impact.

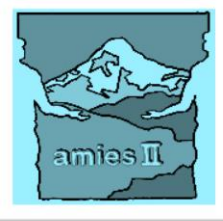




# Genetic Erosion of Crop Varieties

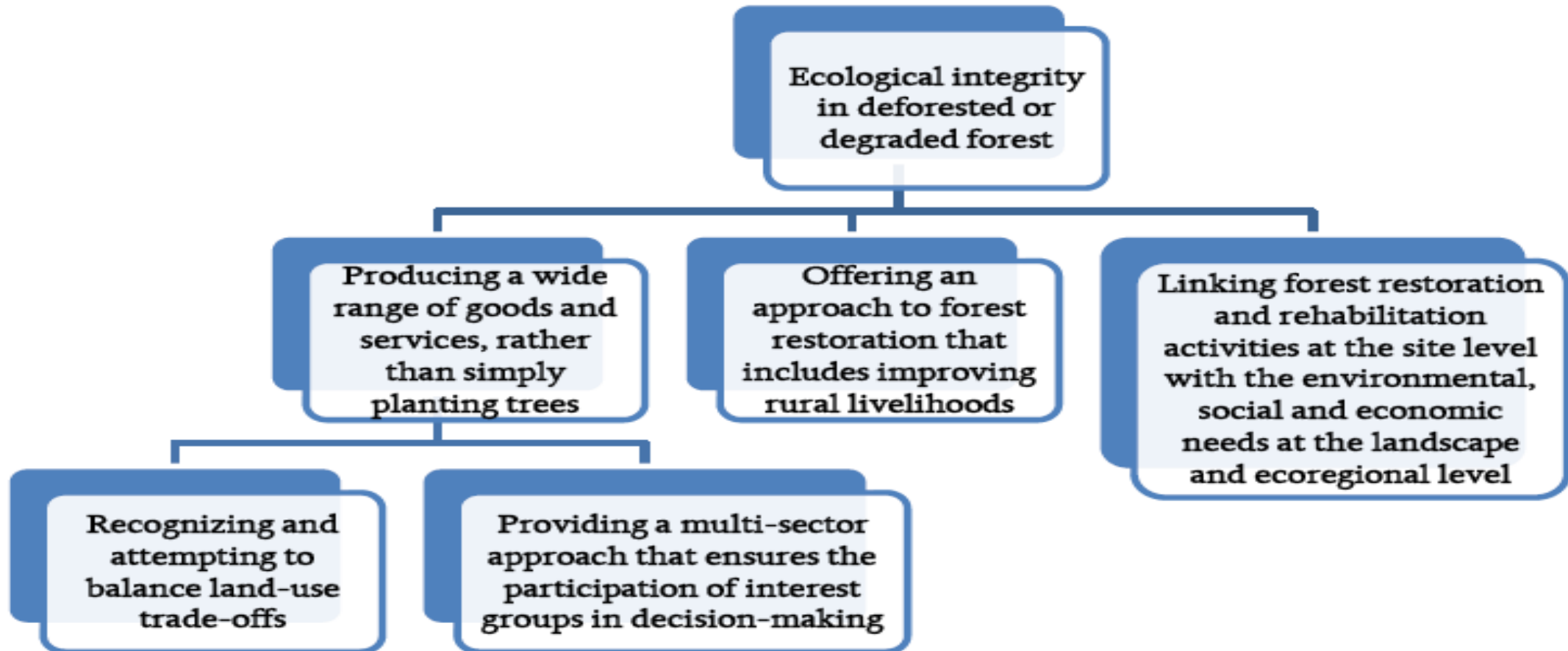
Tree seedlings are grazing by animals and forest is not restoring naturally.



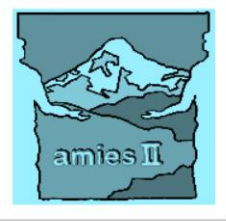


# Genetic Erosion of Crop Varieties

Forest planting is good relation for restoration of plant wild species resources.

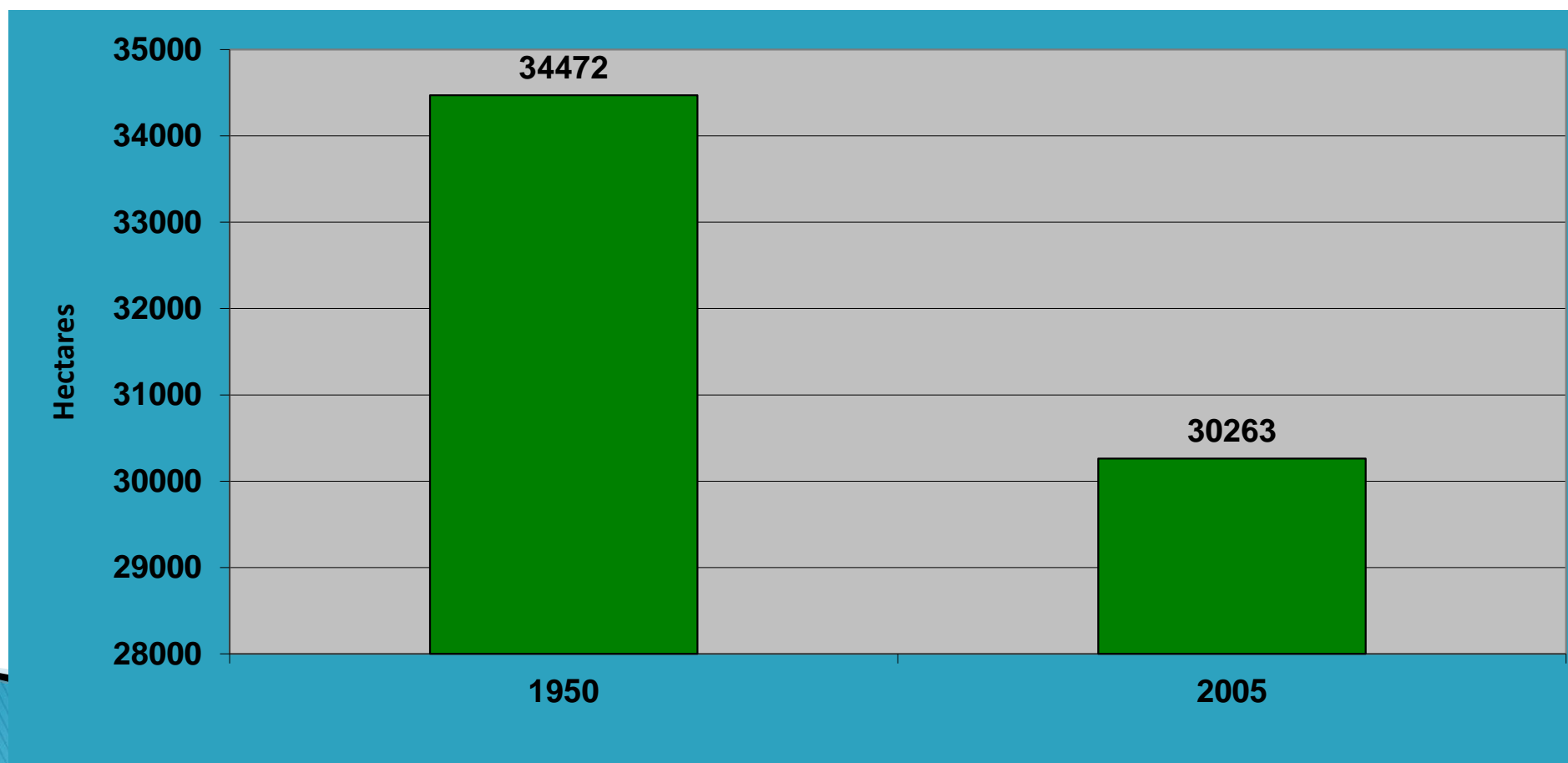






# Genetic Erosion of Crop Varieties

Investigation on exchange on mountain agriculture and plant resources will now be rapidly accelerated in the vital interests of mountain communities.





# Genetic Erosion of Crop Varieties

Thank you

