Collection and *ex situ* Conservation of Coffee Landraces in Ethiopia. The Example of Harerge

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Ethiopia holds a unique position in the world as *Coffea arabica* L. has its primary centre of diversity in the southwestern highlands of that country [1, 2]. Relatively little is known about the situation of coffee genetic resources collected and conserved *ex situ* in Ethiopia, despite a brief overview drawn up about ten years ago [3]. In 2005, we started building up an electronic database of coffee genetic resources at the Jimma Agricultural Research Centre (JARC). A summary of the information generated by that database is presented here.

Material and methods

We used Microsoft® Access 2002 for constructing a relational database and DIVA-GIS Version 5.2.0.3 software [4] for mapping of the collection and conservation sites.
We have chosen Harerge, a coffee zone in the East of the country, to illustrate this collection and conservation work on Ethiopian coffee landraces.

Current status of coffee germplasm conserved *ex situ* by JARC

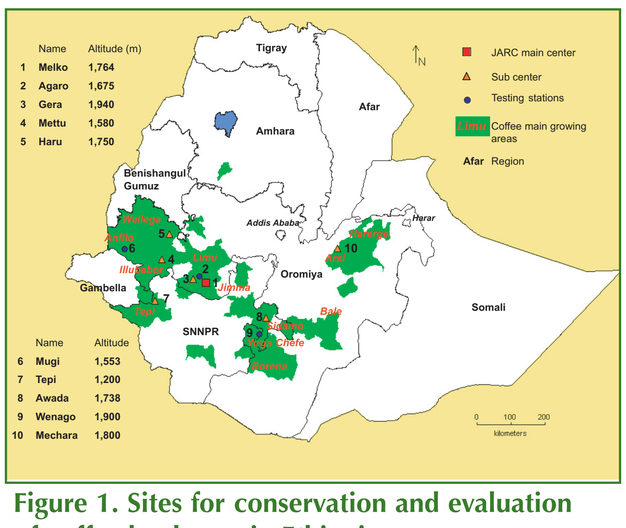

Figure 1. Sites for conservation and evaluation of coffee landraces in Ethiopia.

- 48 collection surveys undertaken throughout Ethiopia since 1966
- 5,109 accessions collected in 101 *woredas* (districts)
- 63% of *woredas* with more than 500 hectares of coffee represented in the collections
- 4,731 distinct accessions conserved by JARC in field genebanks at the Jimma-Melko centre and at 9 sub-centres or testing stations located in the main coffee growing areas (Fig. 1).

Figure 4. Selecting coffee berry disease tolerant mother-tree (left).

However, this germplasm is under threat of genetic erosion due to its high susceptibility to coffee berry disease (CBD) and coffee leaf rust. Die-back frequently occurs due to poor management standards and inadequate shade. Coffee cultivation also faces competition from food crops and chat *(Catha edulis)*, a mild drug used in the Horn of Africa.
Two types of collection have been undertaken: extensive collections to capture genetic diversity, and targeted collections of potential CBD-tolerant landraces (Fig. 4).
Out of 30 *woredas* with significant coffee production, 20 have been surveyed so far (Fig.5). In all, a total of 1952 Harerge accessions is conserved in the JARC field genebanks at the Jimma-Melko centre and Mechara sub-centre, and assessed regularly for yield, disease tolerance, and quality.
The medium-term objective of the JARC breeding programme is to supply Harerge farmers with CBD-tolerant, high-yielding landraces, suitably adapted to their ecological niches, and with the unique Harerge coffee flavour profiles.

Collection of Harerge coffee landraces

In the eastern part of Ethiopia, coffee is found in the East Harerge, West Harerge, and Arsi zones at an elevation of between 1,600 and 2,000 metres. Local coffee landraces are well adapted to these drought-prone areas where they are grown in association with other crops in open sunlight or under a few shade trees (Fig. 2). Farmers have developed many names –17 were recorded by Bayetta [5]– to distinguish between coffee landraces according to their morphological characteristics.

Figure 2. Coffee plantation in Malka Balo *woreda*, Eastern Harerge.

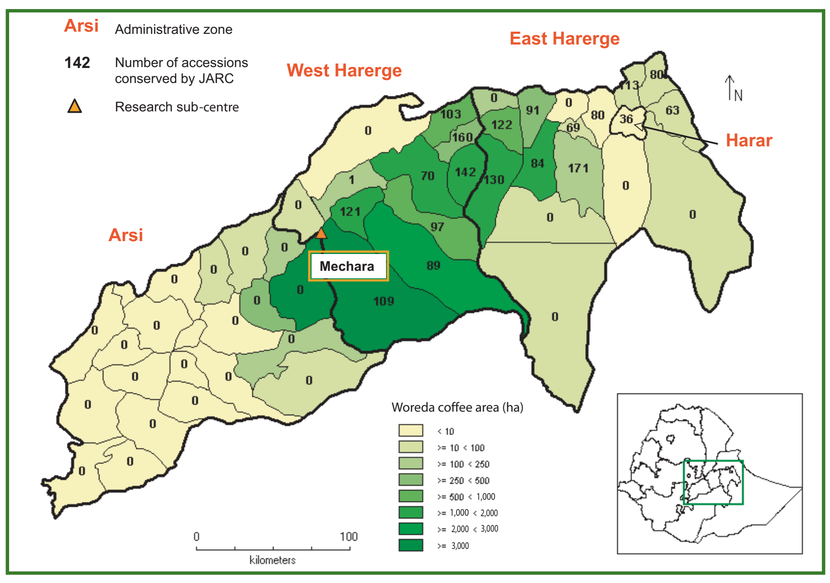

Figure 5. Number of accessions originated from different *woredas* in Harerge and Arsi zones conserved by JARC.

Harerge coffee fetches premium prices in the world market. This sun-dried coffee has an overall cup taste profile displaying a typical mocha flavour, with chocolate notes, in a medium-dense body and a mild, soft acidity with light fruitiness. Coffees from the East Harerge zone achieve an additional premium, especially for the more distinctive golden yellow coloured long-berry beans (Fig.3).

Figure 3. Harerge coffee. "Amber" beans (left) derived from limestone soils.

Conclusion

By using passport data and GIS technology, collection gaps are quickly recognized. This analysis will be further refined by overlaying thematic base maps (climate, soils) combined with agricultural censuses, satellite imagery, and field work data to identify areas under imminent threat of genetic erosion. Maps can also be adapted for marketing, with clearer identification of origins and taste profiles to increase buyer awareness.

References

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