percentages, and a multiple regression analysis was used to identify significant variables that are determinants of migration. The results of the analysis show that significant variables include location/distance of wetland, household size, crop preferences, farming system, drought proneness, changing ecosystems, and farmers' age.

**Keywords**: agro-pastoral communities, climate change, drylands, migration, subsistence farming.

### 2.4.1. Plant genetic resource management and discovering genes for designing crops resilient to changing climates

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Climate change is expected to result in increased frequency of drought, heat stress, submergence, increased soil salinity, etc. Much of the existing literature assumes that farmers will automatically adapt to climate change and thereby lessen many of its potential negative impacts, taking for granted the monumental past efforts at the collection, conservation and utilization of plant genetic resources on which much of farmer adaptation has historically depended. Given potentially large climatic changes, it is dangerous to assume that adaptation of cultivars will happen automatically. Extensive crop breeding that relies on access to genetic resources will almost certainly be required for crop adaptation under conditions of global climate change. Key to successful crop improvement is a continued supply of genetic diversity, including new or improved variability for target traits such as early flowering as an escape mechanism to drought, variation in root traits, water use efficiency, amount of water transpired, transpiration efficiency, osmotic adjustment, stem water soluble carbohydrates, stay green, and leaf abscisic acid reported in many crops. The core/minicore collections developed for many genebank collections may provide new sources of variation for beneficial adaptive traits to climate change. Substantial knowledge and insight is therefore needed to gauge what type of diversity now exists in the genebanks, and what will be needed in the future. Greater investments need to be made in phenotyping and genotyping the native genetic variation contained in seed banks and collecting the remaining diversity particularly that associated with traits of value to crop adaptation to climate change. Plant breeders and other users of genebank collections should play a key role in shaping these efforts to ensure that the end result is useful.

**Keywords**: biodiversity, core collection, drought, genebank, traits for adaptation to climate change

### 2.4.2. Potential and relevance of dryland agrobiodiversity conservation to adapt to adverse effects of climate change

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The region of Central, West Asia and North Africa (CWANA), which encompasses major centers of diversity of many crops of global importance, is expected to experience the adverse effects of climate change more than many other dry areas. It is imperative therefore, that plant breeding efforts are focused on the production of high yielding varieties that are tolerant to higher temperatures and more frequent drought episodes. In this context, landraces and wild relatives of crop plants that are still found within the prevailing traditional farming systems in the drylands and mountainous regions are potential sources of useful genes for plant breeding, focused on the adverse effects of climate change. Unfortunately, the remaining hotspots of dryland biodiversity cannot be sustained due to the combined effects of over-
exploitation of agricultural land, destruction of natural habitats, and modernization of traditional farming systems, which includes replacement of landraces with modern varieties. The region is thus in danger of losing valuable genetic material that has the potential to contribute to climate change solutions. Thus one facet of food security within the context of climate change will be to take measures to secure the region’s genetic resources. The International Center for Agricultural Research in the Dry Areas (ICARDA) is playing a major role in promoting the conservation of genetic resources of cereals, and food and forage legumes, as well as various pasture and range species. ICARDA holds more than 134,000 accessions in its genebank, 68% of which were collected in the CWANA region. Further, its coordination and joint implementation of the GEF-UNDP funded project entitled ‘Conservation and sustainable use of dryland agrobiodiversity in Jordan, Lebanon, Palestine and Syria’ has allowed the development of a holistic approach for promoting community-driven in situ/on-farm conservation of dryland agrobiodiversity. This project assessed the status and major threats to landraces and wild relatives of cereals, food legumes, forage legumes and several fruit trees originating from the West Asia centre of diversity, and developed recommendations for their conservation. Remaining areas rich in biodiversity still need to be identified, and appropriate in situ conservation management plans require implementation. In summary, rehabilitation of degraded ecosystems as well as appropriate ex situ and in situ conservation measures need to be promoted at national, regional and international levels to ensure the continuous supply of adapted genetic resources to supply crop improvement programs. While a wealth of genetic resources have been collected from the region and conserved in genebanks, a thorough gap analysis is needed to identify areas in which native germplasm is still evolving under harsh conditions, so that existing ex situ holdings can be enriched by targeted seed collection missions. To facilitate the efficient and effective exploitation of large ex situ collections for climate change breeding, a rational method is required to select appropriate material from genebanks to screen for desirable traits. ICARDA, in partnership with ARIs, is developing a set selection methodology, the Focused Identification of Germplasm Strategy (FIGS), that uses detailed agro-climatic data and statistical models to develop tailor-made trait-specific subsets of germplasm for breeding programs. Once appropriate donor germplasm has been identified, intensive pre-breeding activities are needed to introgress genes from landraces and wild relatives into improved genetic backgrounds. This paper presents ICARDA’s strategy to promote ex situ and in situ conservation of dryland agrobiodiversity and its subsequent use in plant breeding efforts for dryland areas that will be affected by climate change.

Keywords: adaptation, climate change, conservation, dryland agrobiodiversity.

2.4.3. Reviving beneficial genetic diversity in dryland agriculture: a key issue to mitigate negative impacts of climate change

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The unpredictable nature of climate change challenges the most of the established agricultural practices. The concept of food security and yield stability must be addressed with regards to all possible agronomic solutions to future climatic instability. Evolutionary and participatory plant breeding methods are effective approaches to the agronomic problems associated with climate change. One of the main objectives of conventional breeding programs for self-pollinating cereal crops is to develop genetically uniform varieties. This