Chapter 3
Indigenous and Local Knowledge Practices and Innovations for Enhancing Food Security Under Climate Change: Examples from Mijikenda Communities in Coastal Kenya

Leila Ndalilo, Chemuku Wekesa, and Musingo T. E. Mbuvi

3.1 Introduction

Agricultural production is increasingly becoming vulnerable to climate change. Studies have predicted that the average global temperature may increase by 1.4–5.8 °C by the end of the twenty-first century, leading to substantial declines in freshwater resources and agricultural yields of major crops such as maize, rice and wheat (FAO 2011; IPCC 2014a). At the same time, a growing consensus is forming that global population will grow rapidly, possibly reaching nearly ten billion people by 2050 (FAO 2009). Thus, providing adequate and nutritious food for this expanding population will pose a further significant challenge to the global agriculture system (IPCC 2014b).

Sub-Saharan Africa (SSA) is one of the world's regions with the lowest food security (FAO 2015) (Chap. 1 Vol. 1). Estimates from the Food and Agriculture Organization (FAO) suggest that one in four people in SSA lacks adequate food to sustain an active and healthy life (Bremner 2012; FAO 2015) (Chap. 1 Vol. 2). While this is an improvement on the 1990 levels (one in three), the total undernourished population has increased from 182 to 287 million, largely due to the rapid population growth (FAO 2015) (Chap. 1 Vol. 1). SSA continues to lag behind the rest of the world in terms of reducing chronic hunger (see Chap. 1 Vol. 1), while combating hunger and achieving food security remain a complex sustainability challenge, particularly in light of climate change (Hall et al. 2017) (see Chap. 2 Vol. 2).

L. Ndalilo (✉)
Kenya Forestry Research Institute, Malindi, Kenya

C. Wekesa
Kenya Forestry Research Institute, Wundanyi, Kenya

M. T. E. Mbuvi
Kenya Forestry Research Institute, Nairobi, Kenya

A. Gasparatos et al. (eds.), *Sustainability Challenges in Sub-Saharan Africa II*, Science for Sustainable Societies, https://doi.org/10.1007/978-981-15-5358-5_3

The impacts of climate change are likely to be very severe in SSA because of the high dependence on agriculture for livelihoods and subsistence (Chap. 1 Vol. 1) and the limited adaptive capacity (Collier et al. 2008) (see Chap. 2 Vol. 2). Furthermore, the high population growth is likely to exacerbate food insecurity in rural areas of SSA, whose populations mainly depend on agriculture and have limited capacity for alternative livelihoods (Rosenzweig and Hillel 2008). Already, there is an observed decline in crop yields in arid and semi-arid areas of SSA, which has caused food shortages and large food inflation due to the relatively large economic dependence on natural resource sectors such as forestry, agriculture, water and fisheries (Poya et al. 2002; Prasad et al. 2014). Projections show that by 2055, the yield of cereals in SSA could decrease by 10–20% relative to yields in the 1990s if appropriate adaptation mechanisms are not developed and implemented (Mutegi et al. 2018).

Traditionally, extreme climate events such as droughts and floods were relatively predictable, but in the last three decades, the variability and unpredictability of the patterns of rainfall, temperature, flooding and droughts have increased (Mutegi et al. 2018) (Chap. 6 Vol. 1; Chap. 2 Vol. 2). For instance, in Kenya, prior to the 1990s, droughts and famines occurred in a cyclic pattern once every 10 years, i.e. on the fourth year of every decade (i.e. 1964, 1974, 1984). However, in the last two decades, droughts and floods have become rather irregular and more frequent, disrupting the traditional systems of disaster prediction and preparedness (Mutegi et al. 2018). Such climatic extremes and unpredictable events have caused declines in agricultural productivity and created uncertainties for stakeholders involved in agricultural value chains, particularly farmers, policy-makers, extension workers and donors (Mutegi et al. 2018).

The nexus of agricultural production, livelihoods, food security and climate change is a key sustainability challenge in many SSA countries including Kenya. Actually it spans many Sustainable Development Goals (SDGs), such as SDG1 (No Poverty), SDG2 (Zero Hunger) and SDG13 (Climate Action), among others. For example, climate change affects agricultural systems in multiple ways and has a direct impact on food security and agricultural productivity (IPCC 2014b). Climate change is also likely to affect agrobiodiversity through drying up of streams/rivers, loss of crop storage quality, loss of pastureland and land degradation, among other mechanisms (Enete 2009; IPBES 2018). Agricultural systems, on the other hand, contribute to climate change both through anthropogenic greenhouse gases (GHG) emissions and the conversion of non-agricultural land uses, including forests (Chap. 3 Vol. 1; Chap. 5 Vol. 2). In fact, agriculture is directly responsible for as much as 14% of total GHG emissions, with agriculture-driven deforestation accounting for an additional 18% of emissions (IPCC 2014a).

Thus, agricultural production systems in SSA have to be designed and maintained to provide effectively sufficient and nutritious food for a growing population in an environmentally, socially and economically sustainable manner (Roué et al. 2016). Indigenous and Local Knowledge (ILK) practices and innovations can potentially offer solutions to some of these challenges posed by climate change to the agricultural sector, while it can be directly applied for weather forecasting, vulnerability assessment and climate change adaptation (Chaps. 6, 10 Vol. 1). Many different ILK