

Chapter 9

The African perspective I: using the new biosciences to support the African development agenda

Emerging plant-based initiatives in an African Bioeconomy

Biopharmaceutical proteins and vaccines are traditionally produced in bacteria, eggs, yeast and animal cell cultures and are well established industries. More recently, these molecules are produced in plants and became known as biopharming. Plant-based production systems have the advantages of eukaryotic protein processing properties, inherent safety due to a lack of adventitious agents, substantial cost reduction and facile scalability. The latter was demonstrated in two therapeutic and industrial enzyme technoeconomic case studies (Tusé et al., 2014). These advantages however are molecule/product-specific and depend on the relative cost-efficiency of alternative sources of the same product (biosimilars) or improved products (biobetters). Nevertheless, plant-based manufacturing is estimated to reduce the running costs (20-25%) and capital expenses (40%) compared to animal cell-based processes (Gleba and Giritch, 2012). A facility with the capacity of 1 ton of antibody per year would cost less than \$50 million and operation costs for the first 3 years would amount to \$45-60 million (Gleba and Giritch, 2012). Such a low financial entry barrier represents a very attractive opportunity for manufacturers in developing countries (Gleba and Giritch, 2012). In addition, the Defence Advanced Research Projects Agency (DARPA) recognises that plant-based transient systems overall represent the best manufacturing technologies when dealing with bioterrorism and pandemics. Biopharming is advancing fast and numerous reviews cover the latest developments concerning vaccines (Rybicki, 2014), antibodies (Whaley et al., 2014), purification strategies (Buyel and Fischer, 2014) and manufacturing platforms (Gleba and Giritch, 2012; Klimyuk et al., 2014).