

Abstract The forecasted 9.1 billion population in 2050 will require an increase in food production for an additional two billion people. There is thus an active debate on new farming practices that could produce more food in a sustainable way. Here, we list agroecological cropping practices in temperate areas. We classify practices according to efficiency, substitution, and redesign. We analyse their advantages and drawbacks with emphasis on diversification. We evaluate the potential use of the practices for future agriculture. Our major findings are: (1) we distinguish 15 categories of agroecological practices (7 practices involve increasing efficiency or substitution, and 8 practices need a redesign often based on diversification). (2) The following agroecological practices are so far poorly integrated in actual agriculture: biofertilisers; natural pesticides; crop choice and rotations; intercropping and relay intercropping; agroforestry with timber, fruit, or nut trees; allelopathic plants; direct seeding into living cover crops or mulch; and integration of semi-natural landscape elements at field and farm or their management at landscape scale. These agroecological practices have only a moderate potential to be broadly implemented in the next decade. (3) By contrast, the following practices are already well integrated: organic fertilisation, split fertilisation, reduced tillage, drip irrigation, biological pest control, and cultivar choice.

Keywords Agroecology · Diversification of cropping system · Efficiency increase · Substitution · Systems redesign

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