The global challenges facing the water resources and irrigation sector

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Abstract. Population growth has significantly increased while the water resources have not. In 1950, per capita water share was 12,050 m^3/year, reduced to 7,310 m^3/year in 2000 and is expected to be 4,580 m^3/year by 2050. This is a significant reduction of 62% in per capita water share within a century. At the same time, water consumption is expected to increase by 50% by 2050. There is an urgent need for more water supply. In addition, according to the UN Department of Economic and Social Affairs, DESA (www. un.org/en/desa), the world population is expected to increase from 8 billion in 2022 to 9.8 billion in 2050 and to 11.2 billion in 2100. Subsequently by 2050, the food demand is expected to increase by 100% requiring more irrigation water (globally, on average, irrigation consumes 70% of freshwater resources). More efficient irrigation networks and irrigation systems, as well as water saving technologies, are needed to meet this challenge. The future climate change predicts more frequent extreme events of flood and drought. Irrigation and food production requires a steady water supply throughout the year. Climate change predicted increased and reduced rainfall in different parts of the world. Reduced rainfall leads to reduced runoff, river flow and groundwater recharge. Steady water supply for irrigation and food production can only be met by more storage reservoirs. Currently, there is a gap between water supply and demand and it is continuously increasing. By 2030, a 40% overall gap between global water supply and demand is expected and this will increase further by 2050. The gap between water supply/availability and future demand is widening over time. We will need to increase water supply by using non-conventional water resources, increasing rainwater and runoff harvesting and store water in reservoirs. Dams and reservoirs provide a steady flow for the whole year enabling us to apply integrated water management for agriculture and food production under changing climate. For the future, multipurpose dams and reservoirs for water and energy security are preferred over single use dams and reservoirs. Improving the irrigation application and conveyance efficiencies by lining the canal network and reservoirs will help in reducing losses by seepage and leakage. Using more efficient irrigation systems can also help in water saving. Adopting the concept of Water-Energy-Food Nexus is necessary for a holistic management to produce more crop per drop per kilowatt per unit area of land.