**KSA 4: WATER UTILISATION IN AGRICULTURE**

**TABLE 1**

**Overview and description of thrusts and programmes**

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| **THRUST 1: WATER UTILISATION FOR FOOD, FORAGE AND FIBRE PRODUCTION** |
| ***Scope****:* The direction and driving force for research activities and outputs are determined by the strategic focus to improve the knowledge of the processes of production of field, horticultural and industrial crops. |
| ***Programme 1****:* ***Water-efficient production methods in relation to soils, crops and technology in rain-fed and irrigated agriculture*** | ***Scope:*** Water productivity can be increased by producing more with the same use of water or by producing the same with less use of water. This requires understanding of water dynamics in the soil-water-plant-atmosphere continuum, the equipment which is used and the method of production which is followed. Research on all these aspects can contribute to higher water use efficiency in agriculture. |
| ***Programme 2:*** ***Fitness-for-use of water for crop production, livestock watering and aquaculture*** | ***Scope:*** Various processes and factors, which are site-specific, have an influence on the quality of water for crop, livestock and fish production. Significant shortcomings exist in assessment of the fitness-for-use of surface and underground water sources and identifying water-related production problems. The emphasis in this programme is on the efficient use of water and management of water quality for irrigation of crops, livestock watering, aquaculture and inland fisheries in rivers, ponds and dams. |

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| **THRUST 2**: **WATER UTILISATION FOR FUEL-WOOD AND TIMBER PRODUCTION** |
| ***Scope****:* The direction and driving force for research activities and outputs are determined by the strategic focus to improve the knowledge of the processes of production of trees in woodlands, plantation forestry and trees planted in combination with food and forage crops. |
| ***Programme 1****:* ***Water-efficient production methods and systems in agro-forestry, woodlands and forestry plantations*** | ***Scope:*** In catchment areas where trees are a prominent feature of land use, runoff and deep percolation of water can be reduced. Management of these so-called streamflow reduction activities necessitates an understanding of the water use by trees and the competitive or complementary relationship of water use by trees and water use by staple food and forage crops. Due to research specialisation, separate attention is given in this programme to increase the efficiency of water use by trees in woodlands and plantations for fuel-wood and timber production. |

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| **THRUST 3**: **WATER UTILISATION FOR POVERTY REDUCTION AND WEALTH CREATION IN AGRICULTURE** |
| ***Scope****:* The direction and driving force for research activities and outputs are determined by the strategic focus to improve the knowledge of the management processes undertaken by people who are using water. |
| ***Programme 1****:* ***Sustainable water-based agricultural activities in rural communities*** | ***Scope:*** Poverty, hunger and malnutrition amongst rural people are widely recognised as major problems. These members of rural communities, consisting mainly of women, children and the elderly, are also disadvantaged or marginalised for various social, economic and political reasons. A wide-ranging programme is required to support the sustainable development of rangeland livestock, rain-fed and irrigated crop production. Efficient use of water through a combination of agricultural activities can contribute to improving living conditions. Empowerment of rural people can further be promoted through participatory action research which improves knowledge, farming skills and leadership capabilities. |
| ***Programme 2****:* ***Integrated water management for profitable farming systems*** | ***Scope:*** Commercial farming is a major user of water resources and faces a particular challenge to ensure that this share of water is used effectively and efficiently. There is invariably a close link between efficient use and allocation of water and whole-farming profitability. Water management on farms is also time-dependent and based on incomplete knowledge of changes in the weather, prices and technology. Under these circumstances modelling is a powerful tool to provide decision-support and management advice. The focus in this programme is therefore on developing procedures, methods and models to provide advice to farmers on best management practices and the optimal combination of crop and livestock enterprises within the constraints of water, land and capital resources. |
| ***Programme 3******Integrated water – energy – food nexus***  | Scope: The WEF nexus is a multi-centric and transdisciplinary systems approach to resource management that promotes cross-sectoral resource utilisation, development and management in an equitable manner. Adopting the WEF nexus could contribute towards building resilience to climate change and migration by providing integrated intervention guidelines in case of shocks, harmonising interventions, promoting integrated development, and mitigating trade-offs towards resilient communities. |

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| **THRUST 4: WATER RESOURCE PROTECTION, RESTORATION AND RECLAMATION IN AGRICULTURE** |
| ***Scope****:* The direction and driving force for research activities and outputs are determined by the strategic focus to improve the knowledge of the natural processes and people-induced impacts of resource use |
| ***Programme 1****:* ***Sustainable water resource use on irrigation schemes and within river catchments*** | ***Scope:*** With cultivation and irrigation, larger quantities of salts present in the soil and lower strata could be mobilised. Increasing salinity levels and higher water tables threaten the sustainable use of soil and water. Knowledge and tools to manage the quantity and quality of water resources for agricultural production are therefore required. The focus of research is on developing methods and models to manage water distribution and prevent water resource degradation.  |
| ***Programme 2:*** ***Impact assessment and environmental management of agricultural production*** | ***Scope:*** Agricultural decisions to use land and to conserve rainfall, or to withdraw water from rivers, dams and boreholes, has wide-ranging impacts on the natural environment. Intensification of crop and livestock production processes can potentially contribute to higher levels of chemical residues of fertilisers, pesticides and herbicides in surface and groundwater. Precautions must be taken as part of the agricultural production process to protect the terrestrial and aquatic ecosystems. This requires an understanding of the negative impacts of agriculture and guidelines for an assessment and mitigation of those impacts. |