



Evaluating the impact of farm scale innovation at catchment scale

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Hydrological modelling lends itself to other disciplines very well, normally as a process based system that acts as a catalogue of events taking place. These hydrological models are spatial-temporal in their design and are generally well suited for what-if situations in other disciplines. Scaling should therefore be a function of the purpose of the modelling. Process is always linked with scale or support but the temporal resolution can affect the results if the spatial scale is not suitable. The use of hydrological response units tends to lump area around physical features but disregards farm boundaries. Farm boundaries are often the more crucial uppermost resolution needed to gain more value from hydrological modelling.

In the Letaba Catchment of South Africa, we find a generous portion of landuses, different models of ownership, different farming systems ranging from large commercial farms to small subsistence farming. All of these have the same basic right to water but water distribution in the catchment is somewhat of a problem. Since water quantity is also a problem, the water supply systems need to take into account that valuable production areas not be left without water. Clearly hydrological modelling should therefore be sensitive to specific landuse. As a measure of productivity, a system of small farmer production evaluation was designed. This activity presents a dynamic system outside hydrological modelling that is generally not being considered inside hydrological modelling but depends on hydrological modelling.

For sustainable development, a number of important concepts needed to be aligned with activities in this region, and the regulatory actions also need to be adhered to. This study aimed at aligning the activities in a region to the vision and objectives of the regulatory authorities. South Africa's system of socio-economic development planning is complex and mostly ineffective. There are many regulatory authorities involved, often with unclear responsibilities and inadequate procedures of implementing objectives. Planning for development in South Africa needs to take various factors into account. Economic and green economic growth is pursued, while social imbalances are addressed and the environment is protected against unreasonable exploitation. The term Sustainable Development is a neutral concept in the vision of many of the regulating authorities; however, the implementation of sustainability is difficult. This study considers an approach which aligns activities in a specified region to the vision and objectives of the applicable regulatory authorities, as an alternative to achieving objectives strictly through enforcing regulations. It was determined whether objectives of development planning were realistic in terms of water availability. It was established that the position of a farm in the landscape is a determining factor of the impact it has on the catchment area's water supply.

For this purpose, hydrological modelling (SWAT and SIMGRO) was done for the Letaba catchment of the Limpopo Province, on two scales to also accommodate small-scale farming communities more accurately. Parallel to the modelling, the National Development Plan (NDP), the National Framework for Sustainable Development (NFSD), the Integrated Sustainable Rural Development Strategy (ISRDS) and the principles of Water Allocation Reform (WAR) were regarded. For regional categorisation, the relevant municipal Integrated Development Plan (IDP), Spatial Development Framework (SDF), Local Economic Development (LED) plan and the applicable Catchment Management Strategy (CMS) were considered.

The developed Integrated Evaluation Model combined all the visions and objectives of the mentioned strategic documents to specifically assess the contribution a small-scale farm makes. The evaluation results provided insight into the alignment of activities to the ideals of a region and can be useful when formulating actions to reach a common vision. Small-scale farms are well-aligned to the objectives of WAR, the CMS and ISRDS. The farms have a limited contribution to the ideals of the NDP and NFSD and results against the IDP, the SDF and the LED differ considerably for each farm. Furthermore, the results of the farms' alignment with regional objectives do not correspond to the hydrologically ideal locations. Therefore, the development of small-scale farming should take hydrological information into consideration. The Integrated Evaluation Model proves to be valuable, understandable and applicable to evaluate the alignment of small-scale farms to the visions of regulatory authorities. It is also foreseen that the Evaluation model be linked to the hydrological model.

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