Use of SWAT model for evaluation of anthropic impact on water resources quality and quantity in Celone Creek Basin (Apulia – ITALY)

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# PURPOSE

Analysis: -WATER QUALITY (Sediment Yield; N – P Losses)

 HYDROLOGICAL BALANCE
 in CELONE Creek Basin (S. Giuliano Reservoir – 25 millions m<sup>3</sup>)
 in N-W Apulia area at "HIGH DESERTIFICATION RISK"

2) Planning of Best Management Practices (BMP) : structural type (i. e. buffer zones) and managerial type (inputs abatement).







#### **RAINFALL TREND (78-94)**



#### **TEMPERATURE TREND (78-94)**







### **Soil Classification**



#### LAND USE/SOIL TYPE



# NITROGEN LOAD by HRU



# NO3 in percolation



# **PHOSPHORUS LOAD by HRU**





# EROSION (t)



# EROSION (t/ha)



#### SEDIMENT



NUTRIENT	MAX LOSSES (HRU); LOAD	MIN LOSSES (HRU); LOAD
Organic N	W W Tomato/Clay	W W Tomato/Silt-Clay Pasture/Fine Sand
N in subsurface flow	Pasture/Fine Sand	W W Tomato/Silt-Clay
N in runoff	W W Tomato/Clay-Loam	Forest/Sand
NO3 in percolation	Forest/Fine Sand	W W Tomato/Silt-Clay
Insoluble P	W W Tomato/Clay	Forest/Sand Pasture/Fine Sand
Soluble P	W W Tomato/Clay-Loam	Forest/Sand Pasture/Fine Sand

#### WATER BALANCE (mm)



# WINTER WHEAT TOMATO CROP SEQUENCE DATA

	11,000 ha
Area	(75.4 %)
Groundwater	
Recharge	8,243,000 m <sup>3</sup>
Irrigation (ground-	
water withdraw)	35,000,000 m <sup>3</sup>
Recharge/Withdraw	25 %
Annual Deficit	26,757,000 m <sup>3</sup>
Groundwater	12 m / 48 years
Drawdown	(1 m / 4 years)

# CONCLUSIONS

1 - Sediments are not a real danger for the study area. The greatest contribution to sediment yield is given by subbasins occupied by tree crops (olive groves) that yet have a modest extension compared with basin area. These areas therefore could be protected simply respecting the agricultural "best management practices" and undertaking soil and water conservation works.

2 - Actual land management doesn't represent a risk factor concerning **nutrients** mobilization. In fact, where agricultural activities are more intensive there is a regulated fertilization use, while in areas characterized by less human activity the nitrogen and phosphorus concentrations respect normal loads released by normal transformation processes of organic matter.

# CONCLUSIONS

**3** - The most important problem emerged by results analysis is the water deficit caused by the huge **groundwater withdraw** (not always authorized). These are almost exclusively destined to winter wheat/tomato crop sequence, for which irrigations are essential in summer months, when however there are high temperatures, few precipitations and maximum evapotranspiration.

**4** - The research showed that aquifer recharge areas coincide with **forests** which assume therefore great importance to save groundwater resources quantity. To valorize such role forests management should not only be devoted to normal productive finalities, but also, and above all, to preserve landscape, improving the soil water absorption capability, increasing effective infiltration.

# CONCLUSIONS

**5** - The analysis underlines current land use irrationality (winter wheat/tomato alternation) which cannot be sustained longer. Groundwater abuse, in effect, on one hand is slackening the artificial reservoir filling, making vain its building costs (economic and environmental); on the other it can damage aquatic ecosystems, since the water quantity is lesser than the minimum flow requisite for flora and fauna survival in freshwater. Uncontrolled withdrawals are determining the consistent groundwater drawdown observed in last years.

**6** - From simulation results emerges the **satisfying reliability of SWAT outputs** that is expected to become higher as soon as more frequent (in space and time) measured values are available (ongoing projects). That confirms the model utility, together to the GIS technology, both in the evaluation of land use impact (referring particularly to diffuse pollution) and, in general terms, in the territory study and management. Thanks to these tools, in fact, it is possible not only to define damage type and entity, but also to locate its exact position in examined area. In this way it is possible to realize rehabilitation works that will have a greater effectiveness and will be economically more rational.





#### NITROGEN BY HRU (Kg/ha)



#### PHOSPHORUS BY HRU (Kg/ha)



#### SEDIMENT (t/ha)



#### **SEDIMENT YIELD**

