To Main Proceedings Document

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LAND, WATER, POLLUTION AND PRODUCTION IN AGRICULTURAL DEVELOPMENT: THE CASE OF "GAP"

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Southeastern Anatolian Project (GAP) is an integrated agricultural development project located in southeastern Turkey.

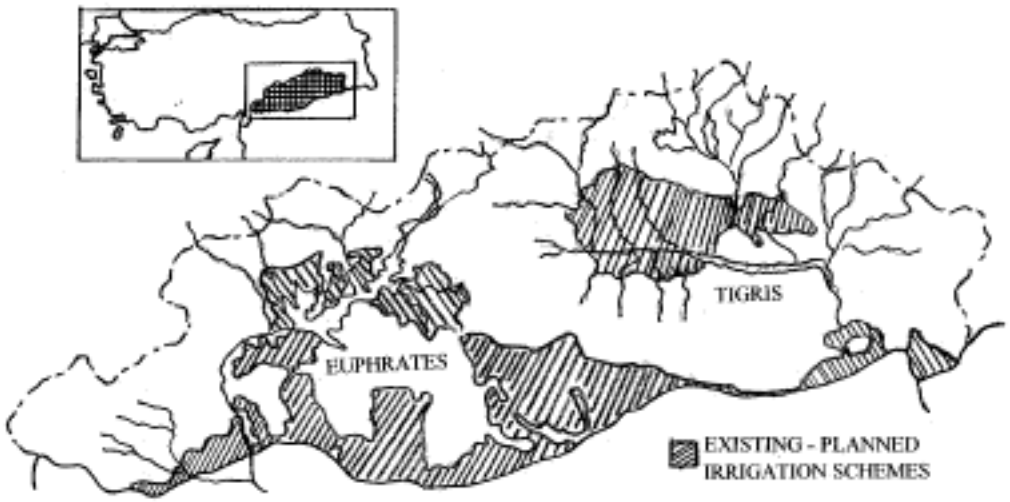
•13 individual water development projects
•22 dams and 19 hydropower plants on the Euphrates and Tigris rivers
•Total cost of GAP investments are estimated to be 32 billion USD (yet about %50 of it realised)

Targets

•Energy production: 27000 gWh/year

•Irrigation: 1.7 million ha lands

•Urban employment: 1.25 million jobs



Major agro - environmental problems

- Salt accumulation on arable lands in semiarid environments
- toxic effects of synthetic pesticides on biota
- nitrate and phosphate accumulation in freshwater supplies
- soil erosion because of insufficient conservation practices

Other problems of major concern since 1980s

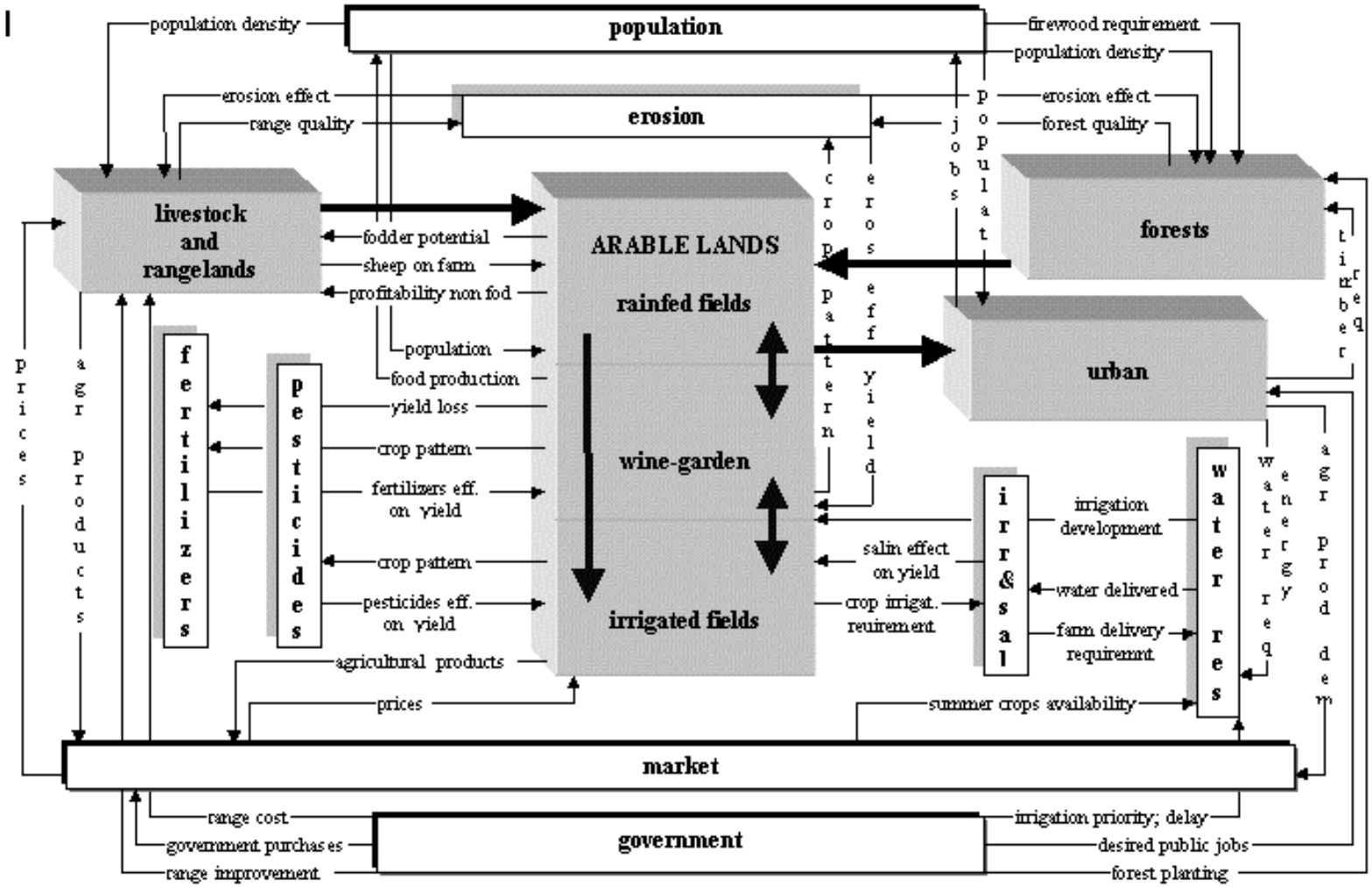
- When hydropower production, water release for neighbor countries and requirements of alternative crop patterns are considered, is the water sufficient to achieve the targets?
- How will be the future crop patterns and production levels when agronomy, market and tradition is considered?
- Shall we be able to achieve target employment levels in an agriculturally driven economy?

What did we aim?

Can a holistic, integrated conceptualization of those problems associated with GAP help us in analyzing the possible regional environmental change in the long term?

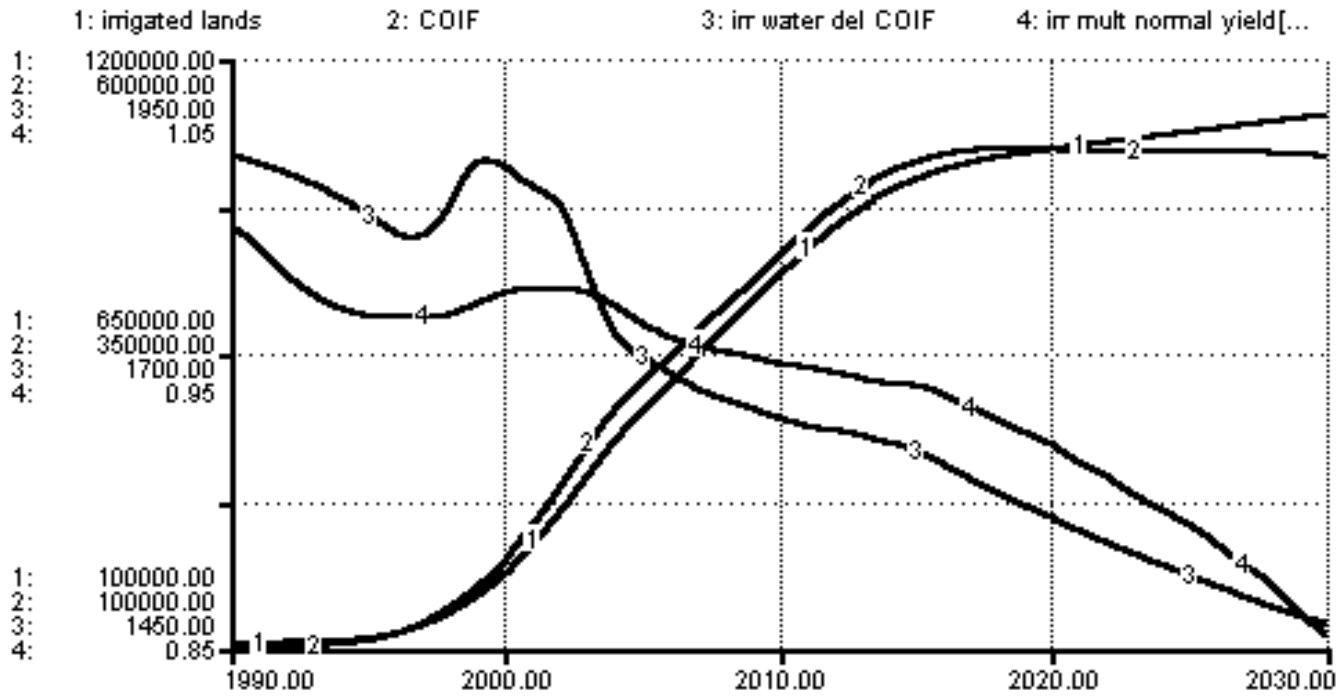
Can we design macro policies to achieve better system performance in terms of land use, water consumption, agricultural pollution and production in the region?

GAPSIM: Dynamic Simulation Model for Long Term Comprehensive Environmental Analysis of GAP

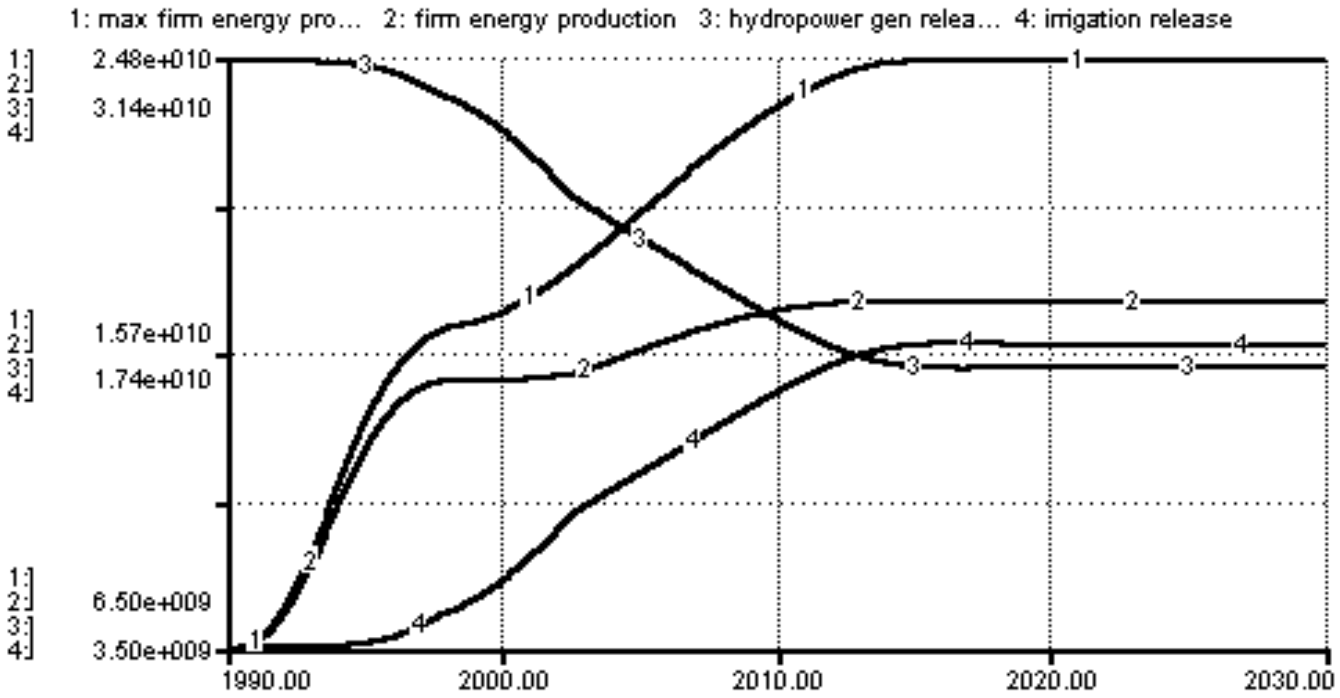


Some remarks on the model reference run

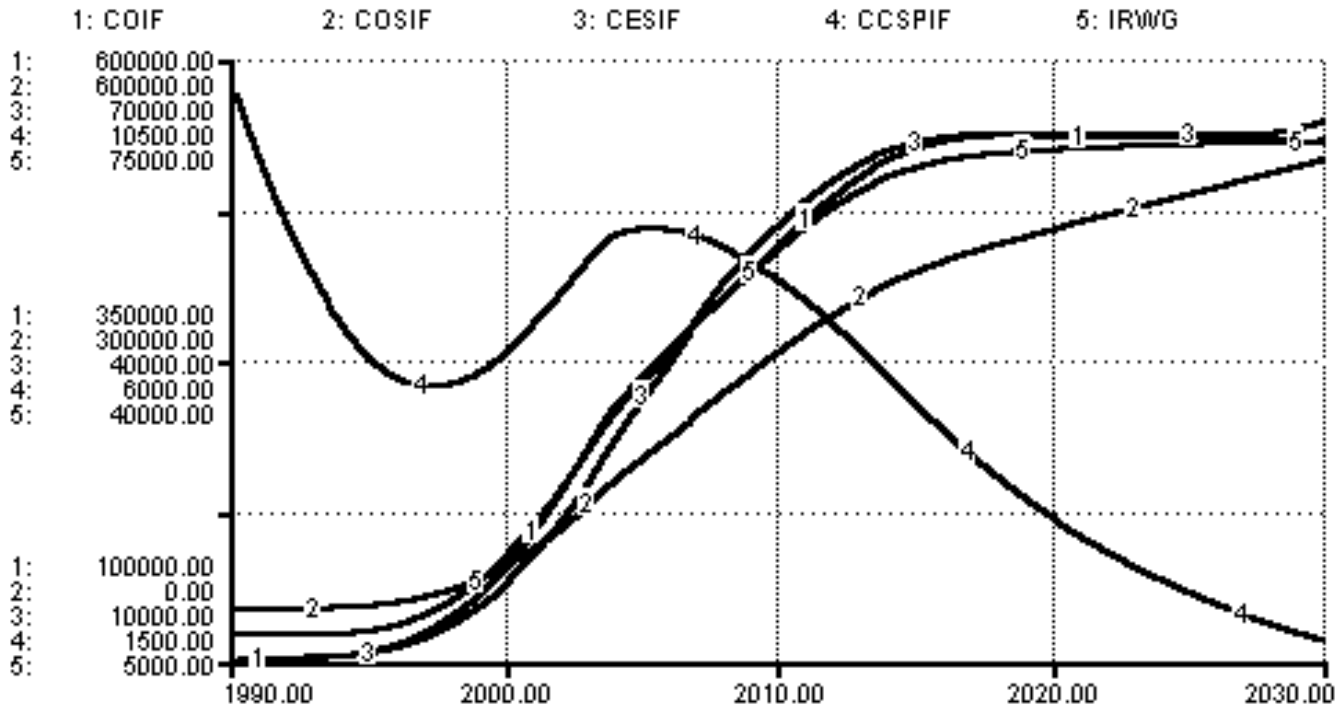
•GAP faces a considerable water scarcity because of high stimulation of the production of most water consumptive crop cotton.



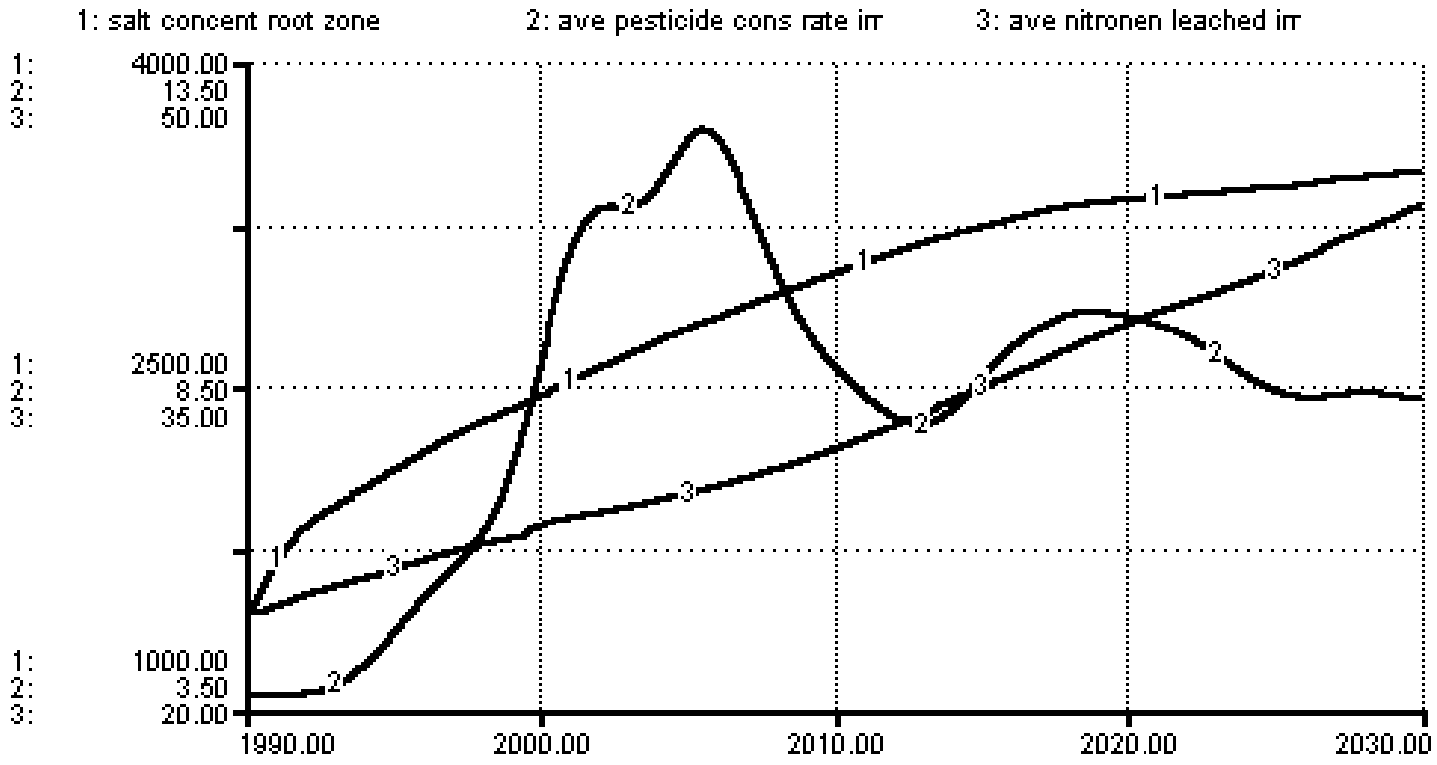
•As irrigation releases increase and potential release for hydropower production decrease, firm energy production stagnate at about 18 billion kWh/year.



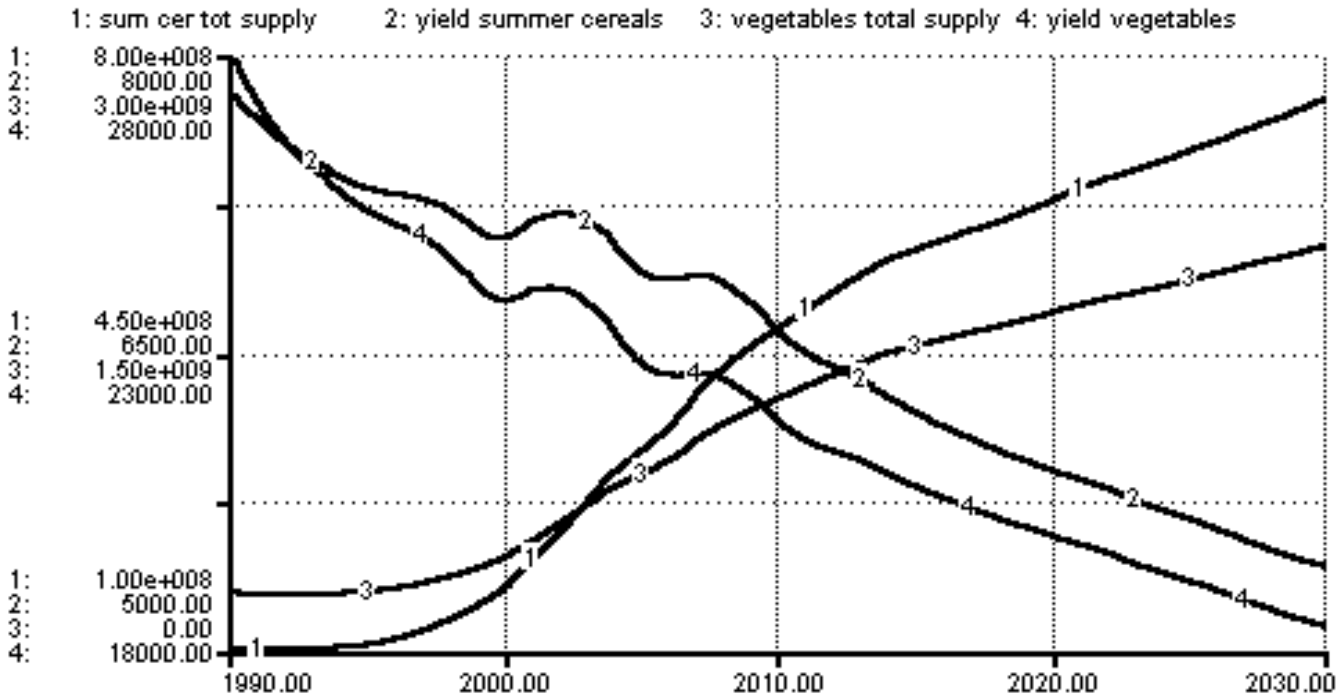
•The undesired situation in irrigation development is mainly because of the increased land allocation for high water demanding crops and especially for cotton monoculture (ha).



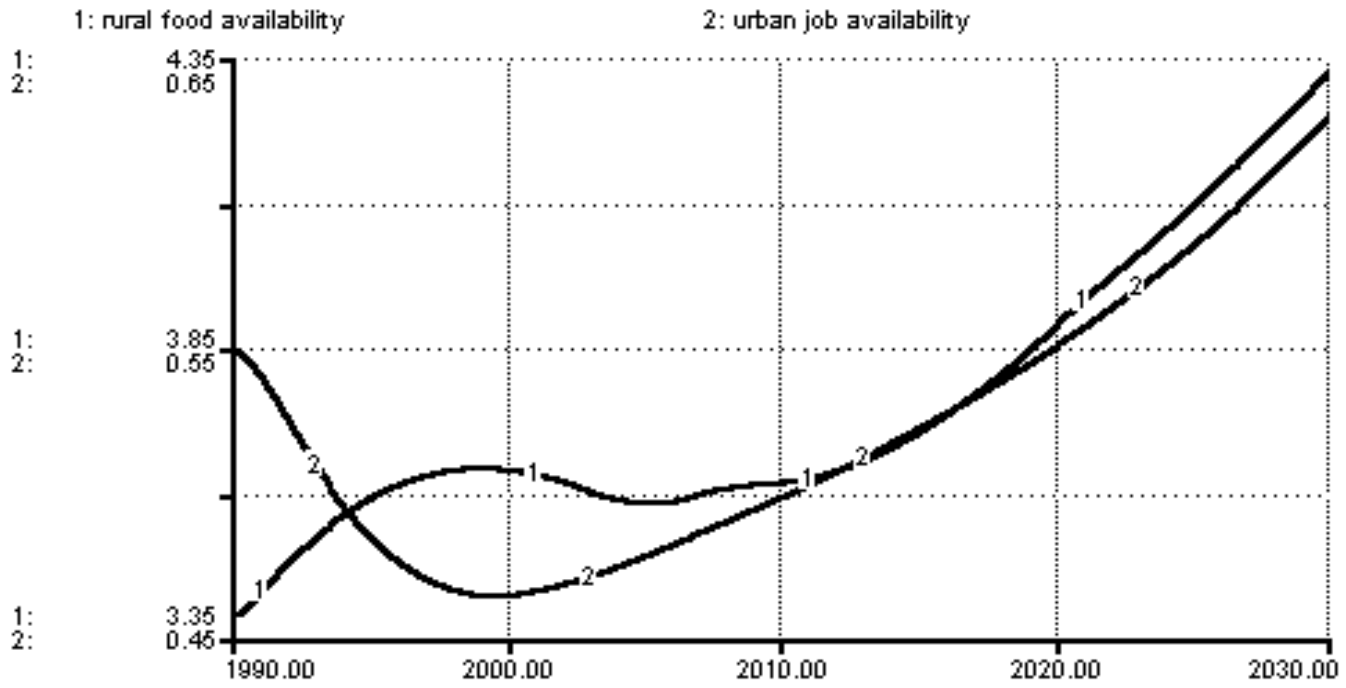
•On irrigated lands, the average salinization (mg/l) and average pesticide consumption (kg/ha/year) increase; decreasing farm yields are tried to be compensated by increased fertilizer application (kg/ha/year).



•Production of agricultural commodities (kg/year) eg. oil crops and summer cereals increase but yields (kg/ha/year) decline although fertilizer consumption rates increase.

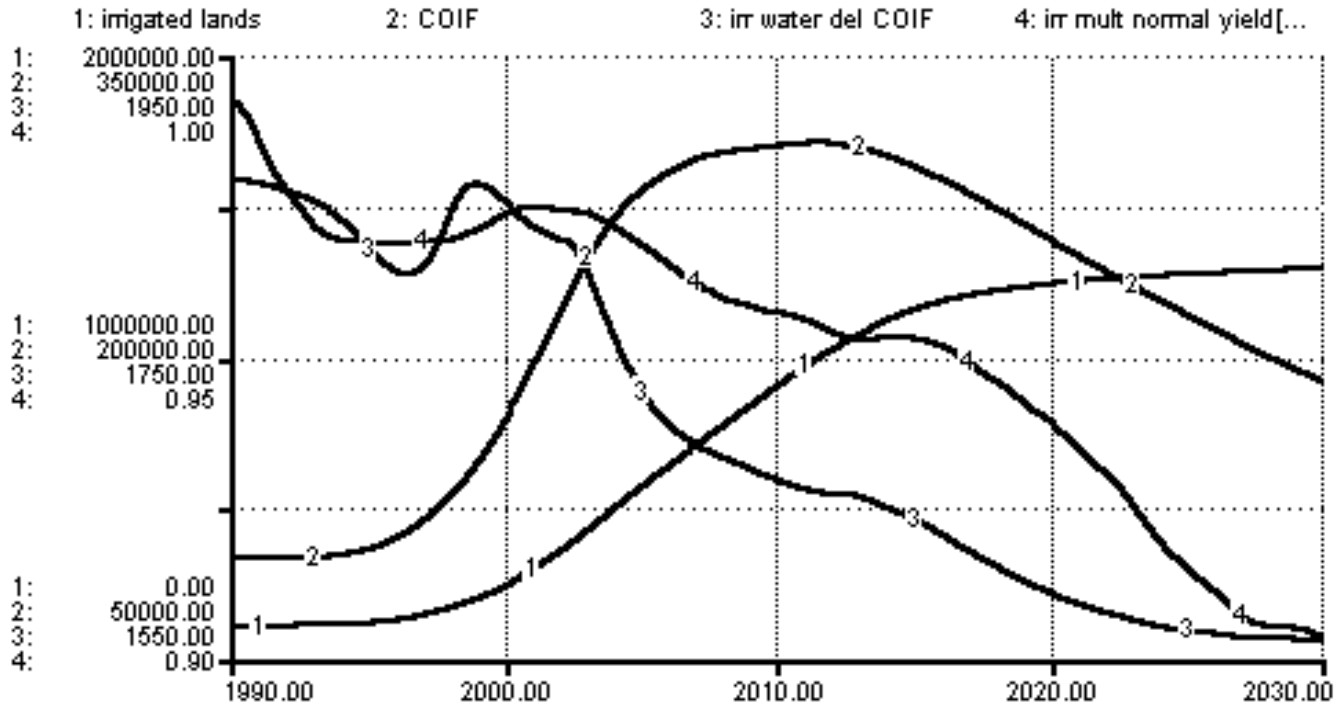


•Rural food availability and urban job availability are relatively improved after year 2005.

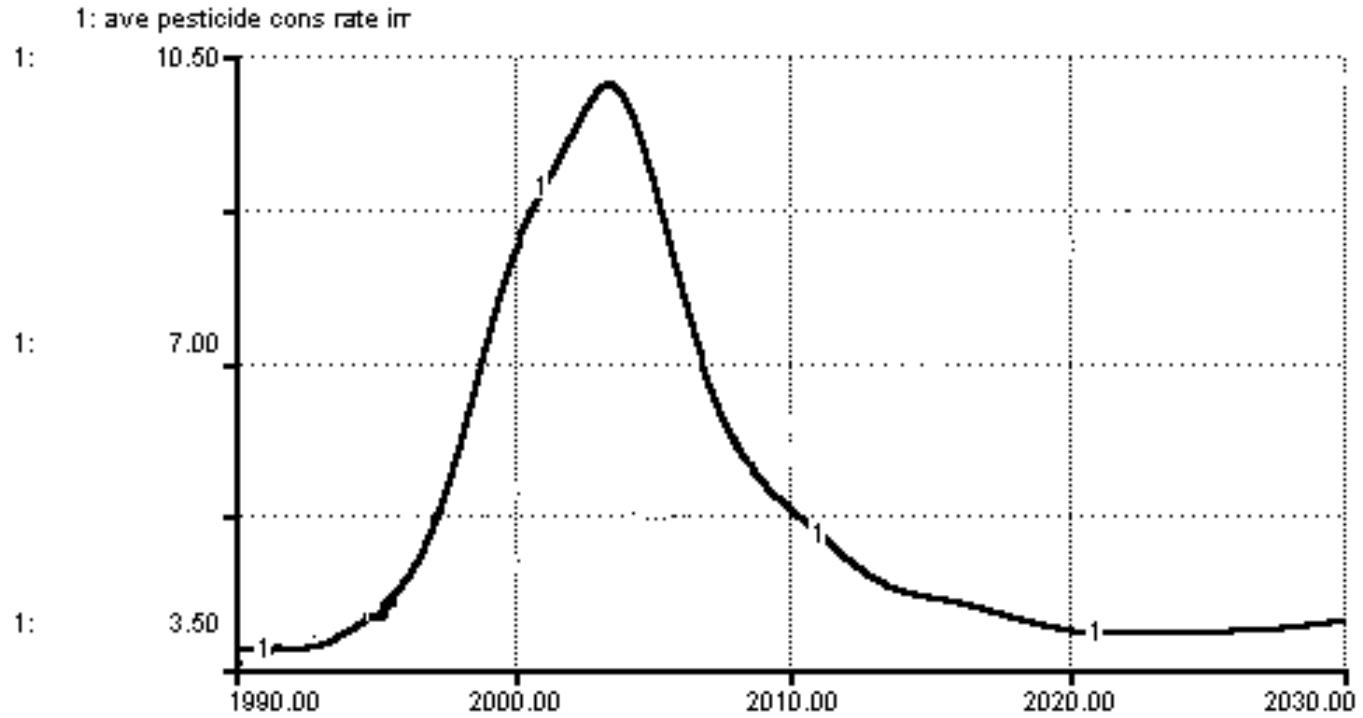


A scenario analysis: traditional attitudes in crop preference change after year 2000

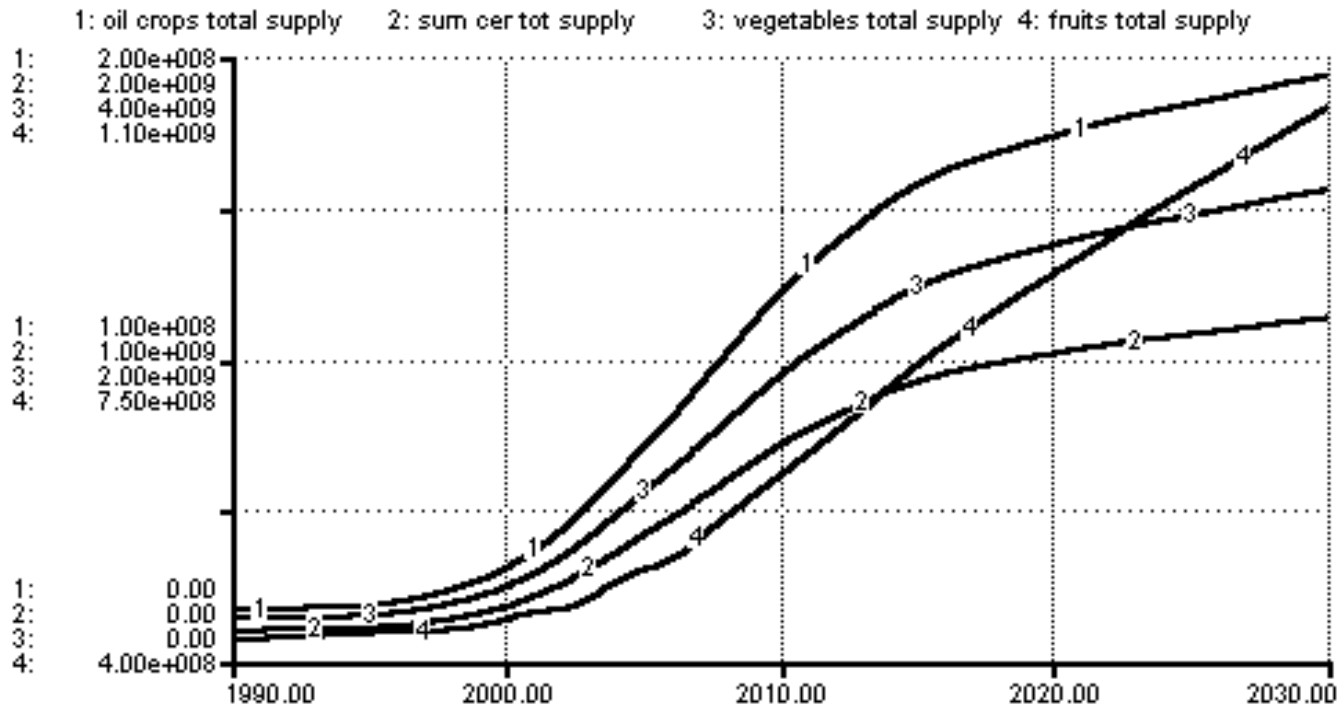
•Intensity of cotton mono culture decreased, higher irrigated lands achieved and irrigation water availability on individual farms is improved.



• By decreasing cotton mono culture, average pesticide application rate (kg/ha/year) decreased.



•Production of certain summer crops (kg/year) such as oil crops, summer cereals, vegetables and fruits are increased.



Concluding remarks

•GAPSIM was an attempt to integrate various components of GAP socio-environmental system for policy analysis at macro level.

•Policy and scenario analysis with GAPSIM reveal that there exists redundant model components, whose feedback connections with the entire model is not essential for this purpose.

•On the other hand, at our level of analysis, policy considerations related with *equity in farmers' access to markets and water*; *farmers' education;* and *water release strategy* tend to be very effective in system performance.

•Therefore, a more powerful minimized version of GAPSIM, with an improved structure for the analysis of the above critical problems can be rebuilt.