

## PEDA for AFRICA:

### The ECA's contribution to modeling population, environment, development and agriculture interactions for policy support and advocacy.

To advocate for an holistic approach to Africa's development issues, the Commission has developed an interactive computer simulation model that illustrates the interactions between population changes (P), the environment (E), socio-economic development (D) and agriculture (A). The PEDA model is an advocacy tool designed to illustrate the likely impact of alternative policy options on the food security status of the population. As food security is a factor of evolutions in the areas of population, environment, agriculture and socio-economic development, the model demonstrates the relationships between these fields as well. Recently, an HIV/AIDS component has been introduced to account for its impact on both agricultural and human development variables. As such, the PEDA model is capable of providing indicative answers to a wide range of development related policy questions.

### Policy Questions

"What is the effect of increased education on the environment and land degradation?"

"How does a decline in fertility rates influences the agricultural production in a country?"

"What is the impact of HIV/AIDS on agricultural outputs?"

"What will be the effect on the food security status of the population if the government took measures to increase fertiliser and machinery use in agriculture by 2% a year?"

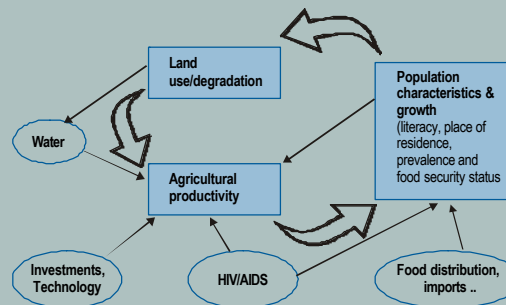
"What will be the impact on the food security situation in a country if the educational enrolment rates would immediately be brought up to 75% for both sexes?"

### The theory

The theoretical inspiration for PEDA comes from the "vicious circle model" that was originally developed at the University of Cambridge. The vicious circle assumes a causal chain of interactions between poverty, high population growth, environmental degradation and decreasing per capita agricultural production.

Central, or characteristic to the PEDA model is its population or human development based approach. It views human beings and their characteristics

### The Vicious Circle



The vicious circle reasoning in PEDA relies on the assumption that the rural, illiterate and food insecure segment of the population tends to deplete natural resources in their quest for survival. When this fraction of the population expands, land degradation increases and as the latter negatively affects agricultural outputs, this contributes to food insecurity. Other factors that influence the food production and food availability in a country and that are accounted for in PEDA are the size and literacy of the labour force; the availability of water; technology use and other investments in agriculture; food imports and the equality in the food distribution.

Although its theoretical inspiration comes from the vicious circle theory, PEDA can also capture a virtuous chain of interactions (e.g. through assuming increasing efforts in agricultural intensification in regimes with high population growth rates, through increased efforts in land regeneration, etc.)

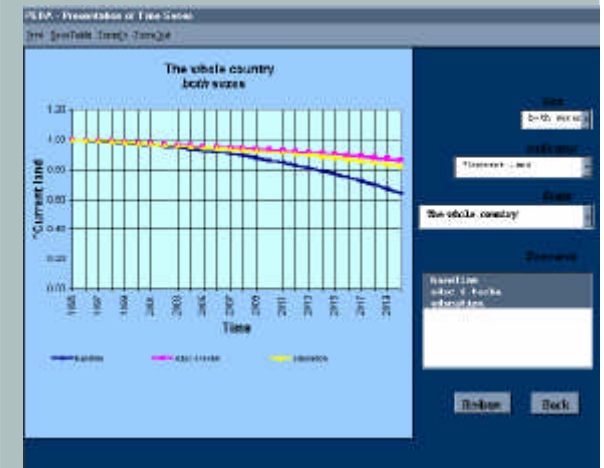
(education, health status, food security status and place of residence) both as the agents of social, economic, cultural and environmental change and as those who first risk suffering (or benefiting) from repercussions of these changes. The economic environment, (e.g. the importance of markets in distributing goods) plays only an intermediate role and is not seen as an end in itself nor the primary objective of the modelling exercise. In this, the population-based approach differs from much of the development economics literature.

### The practice

The simulation exercise in PEDA consists of three steps or components. First, (multi-state) population projections are carried out to determine the size and characteristics of the population. Simultaneously, the model estimates the food availability as the sum of food production and net trade. Agricultural production is considered as a factor of the natural resources stock (land and water); the size and productivity of the labour force (endogenously determined by the model through the population projections) and technological inputs and innovations in agriculture. Thirdly, the estimated available food is distributed over the population following a non-linear food distribution curve to determine the fraction of the population that will be food insecure.

Through the manipulation of a number of scenario variables, the user can project the likely course of the values for a wide range of indicators. Among them are the total population; the natural resources stock; agricultural outputs; literate life expectancy and food security. In addition to storing all the output in standard database format,

### Screenshot of the output in PEDA



the PEDAs software contains an interface wherein the projection results can be presented in the form of time series or population pyramids.

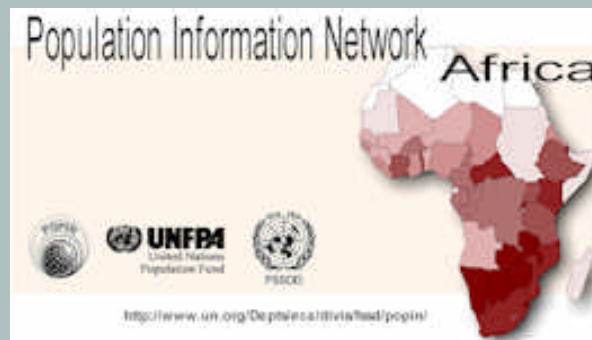
#### What has been done

To date, the PEDAs model has been initialized for Burkina Faso, Botswana, Cameroon, Ethiopia, Madagascar, Mali, Nigeria, Uganda and Zambia. The year 2000 has been important in the development PEDAs. After the first round of review, the model has been adapted and improved to incorporate suggestions from scientists in different fields and the model has been made more flexible. It, for example, has been generalized to allow for other theoretical assumptions than the vicious circle model; it has been made time independent to allow for the replication of history; a shell has been developed to make the software independent from the data; and the land and water modules have been extended. Additionally, some refinements have been made in the software and new output variables were introduced.

#### What is to be done

A technical and users manual to accompany the distribution of the software are being finalized, and some advocacy booklets that support the ECA's mission of awareness creation on the nexus issues are also under preparation. In addition, the ECA has started presenting the model through workshops for policy-makers and researchers at the Sub Regional Development Centres (SRDC's). As a potential offshoot of these subregional workshops, the ECA will support initiatives from universities and research institutes to collect country specific data. The latter will customize the model to better reflect the situation at the national level and to carry out sensitivity analyses.

Please visit the following web sites for more information on the activities of ECA; the Food Security and Sustainable Development Division (FSSDD) and the PEDAs model:



<http://www.un.org/depts/eca/divis/fssd/popin>



<http://www.uneca.org/estnet>



<http://www.uneca.org>



United Nations  
Economic Commission for Africa

# Population Environment Development Agriculture Model

Software and documentation can be downloaded from the POPIN-Africa Web Site: <http://www.un.org/Depts/eca/divis/fssd/popin/>. For more information mail to: [peda@uneca.org](mailto:peda@uneca.org)  
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