AGROECOLOGY VERSUS CONVENTIONAL AGRICULTURE: AN EMERGY ANALYSIS OF RICE PRODUCTION IN SOUTHERN BRAZIL

PEDRO BAPTISTA DOS SANTOS[*1]; CLITIA HELENA BACKX MARTINS[2]
1.PUCRS; 2.FUNDAÇÃO DE ECONOMIA E ESTATÍSTICA.

Ecological economics searches to evaluate how we can use nature in a sustainable manner. Carrying this approach into account, in this paper we compared two types of cropping systems of rice, an ecological and a conventional one, by using emergy methodology. Created by Howard Odum and developed in Brazil by Enrique Ortega, this methodology consists of calculating the value of the biophysical resources of nature as well as the products of human activity.

Hence the overall objective of the study was to determine which system of rice production is more viable in environmental terms by means of comparing the results of emergy indices, and economically by incorporating the resources of nature in the final price emdolars. Data about the ecological system were obtained across field research at one local cooperative of small farmers; for the conventional system, secondary data were used on general production of rice. Both refers to irrigated rice croplands located in the state of Rio Grande do Sul, Southern Brazil, concerning the period 2010-2011.

The first step was to draw the systems diagrams for the two kinds of production. Thus, it has been noted that there is a waste treatment inside the ecological system. Rice husk which is left in its processing is used in conjunction with swine and household waste to produce organic manure and bio-fertilizer to be used in a new cycle of rice planting. This process completely replaces the purchase of pesticides and fertilizers on the market. In the same way, the plantation of acacia inside the cooperative land produce wood, that serves for drying rice. In conventional management, the waste is not recycled within the system, making that chemical inputs such as fertilizer, urea, fungicides, herbicides and insecticides have to be purchased. Using these inputs, externalities are generated that harm the environment, workers and even consumers, depending on the level of chemical residues in the final product.

In the second step, it was necessary to convert each line of input streams of the diagram to a calculation line of the evaluation emergy table. Thus, the "paths" were evaluated as fluxes in units per year. Both in the conventional and ecological systems, solar radiation, rain, wind and water from the stream were considered as renewable resources. In the ecological system, bio-fertilizer and manure were also considered as renewable resources, as well as the acacia wood. On the other hand, the soil was considered as non-renewable natural resource in both systems, because its loss through erosion exceeds the geological production process. The market materials used in the systems were seeds, agricultural equipment, like steel, diesel, electricity, agricultural facilities, including depreciation of the equipment. For the conventional system were also computed nitrogen, phosphorus, potassium, urea, fungicide, herbicide, insecticide, operations with plane and drying. As services of the market in both systems it was included manpower and fees. In the ecological system was also taken into account the certifications for organic food and technical assistance; in the conventional system it was considered interest on financing, leases, administration spending and externalities.

The third step was to get the emergy indices from aggregate indicators obtained previously through the evaluation table of emergy flows. Comparing the results of the indices, it could be noted that the ecological system has greater ecosystem efficiency,

because it uses more renewable resources, has a lower environmental burden, a higher sustainability index and is more efficient in energy transformation.

Finally, by comparing the market and emdolars prices, some distortions were found because natural resources values are not incorporated in the market prices. If these resources were taken into account as they are in emdolar price, the conventional rice would have a higher price than the ecologic one.

As a conclusion, it can be stressed the role of public politics to contribute to correct market prices distortions in order to ensure the replacement of what is extracted from nature or to maintain natural fertility and promote sustainability. From this same perspective, laws and taxes should be created that reduce the losses of raw materials and include the externalities generated by the system. It should also be encouraged the creation of state subsidies for the properties that promote biodiversity in rural areas as well as the increasing use of renewable resources in agricultural production systems.