

RESULTS OF ENERGY ANALYSIS

"Macroeconomic value" is the amount an economy is stimulated and is measured by embodied energy.

Because people have more free direct use of environmental resources in Brazil, money represents almost 3 times more real value than in the United States.

Selling Brazilian products to developed countries gives 3 times more macroeconomic value than is received in return. Exchange could be balanced by reduction of interest by foreign aid, cultural aid, etc.

Raw products such as iron ore, wood, etc. send much more value out than is received in exchange. Selling these hurt an economy in the long run. These should be used at home.

Alcohol from sugar cane makes only 1.1 times more embodied energy value than it uses. This net energy yield ratio is lower than calculated by others who leave out the embodied energy in environmental inputs and human service. However, because of the high value of embodied energy in Brazilian service, buying foreign fuel is no better. The net energy yield to Brazil from buying gasoline is 1.1. Neither source stimulates the economy the way fuels with higher net energy ratios. Alcohol production beyond that for local consumption hurts the economy by diverting resources from activities with more net energy.

Selling alcohol abroad at current prices sends four times more value to stimulate foreign economies than is received. Even if the money received is used to buy foreign fuel, the trade balance is negative.

Selling cacao abroad sends four times more value than is received, but if the money is used to buy foreign fuel, there is some positive benefit.

Palm oil has more embodied energy than diesel oil and should be used for food rather than fuel. Using palm oil for motor fuel makes 3.7 times more fuel than is used in its manufacture, but the total contribution of embodied energy to the economy is only 1.1 times its inputs.

Since money paid for products goes to people for service, some additional return to farmers is required to maintain land vitality such as government subsidized fertilizer.

To maximize economic vitality, a country should use its own resources plus as much of the imported resources with a positive embodied energy exchange balance as possible.

Trading with less developed countries gives a larger balance of value than trading with a developed country. It is better for the undeveloped country also than trading with developed countries.

The new concepts of embodied energy show that trading for dollars is rarely of value to a developing country and devaluation of currency helps the developed country more.

What is actually evolving in Brazil is a solar energy economy that the world may copy when its fuels are gone.

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Question: Based on observations and research, what do you see for the future of Jari/Amazon Basin?

After development, land clearing for plantations and agriculture goes through a high maximum based on using up the virgin soils, virgin timber, and minerals, then economic activity will come back to a lower renewable basis, one mixing the work of nature through a land rotation cycle with modern technology supplied with rurally distributed hydroelectricity. As the world runs out of its fuels and minerals, the Jari system and the Amazon as a whole will compete better and become economically strong. Particularly where the rich soils are renewed from the rivers coming down the Andes, and where hydroelectric power can be supplied with least diversion of fertile land in reservoirs, a pattern of relative wealth like Switzerland may emerge.

Question: From your analysis, what has been the major insight regarding development and Jari?

Jari may be the best real test case of what is possible on renewable energy and may be a microcosm and guide to the whole basin development. Although the conversion of solar energy to power, food and fiber is not as efficient as some had hoped, a good living standard can result. A good pattern of land rotation will compete economically as alternatives based on fuels disappear. The shifting system may show the whole world how to retain the best of our civilization during a period of life on renewable energy of the planet.

Question: How can we make the Jari a sustainable system producing goods and services for man?

Supply hydroelectricity in place of virgin wood used as fuel, start a longer land rotation with 30 years rebuilding soils and getting natural biomass alternating with 30 years of plantation wood growth so that more energy is stored and soils are maintained. Fertilizer needs can be supplied from hydroelectric energy. Let the Jari area develop more diversity of auxiliary land uses and occupations so that there is a normal pattern of human settlements less directly an economic drain on the production system. Use the products of Jari within the country - better yet, within the region - so that the embodied energy is fully used. If raw products (food, fiber, paper, minerals) are sold on the world market, the money received is mainly for the human service and contributes only one fourth as much to the Amazon economy as local use. Develop rotation patterns between natural wetlands and wetland agriculture and aquaculture. Developing new edible aquatic plants, pharmaceuticals, fibers.

Brazil as a whole should hold onto its present wood biomass system, not yet competitive with fuels, because it will be competitive in the next century. Stop borrowing for massive projects that don't have immediate payback in growth equivalent to interest rates. Instead, accept investments where the return can follow the natural yields. Put the electrification in rural decentralization rather than in massive centers. Follow the Chinese plan of rural electrification and rural supply of fertilizers. Retain the dooryard garden habitations with their diversity of goods, places in forest, and on the river canoes for kids, but add the electric aids of communication, TV, household refrigeration, etc.