

5. The final element is the ability to transmit information and understanding among units of research and extension entities. Because they serve farmers, units and personnel of research and extension are dispersed over wide areas, and communication is not simple, even within each of the entities. Research and extension communication is seldom even near to adequate.

Several of these functions will be recognized as central to FSR/E, and this indicates its role in the technology innovation process. Much technology can be imported. Yet without this basic capacity, a country cannot take advantage of the technology available.

F. International Technology Transfer

Hyami and Ruttan in Agricultural Development: An International Perspective present a model of international technology transfer and an analysis useful in R/E project development. The model was developed from historical studies and is supported with empirical data. The model recognizes three stages of technology transfer among nations.

1. Materials transfer is the simplest. Technology is often embodied in a commodity--seed, machine, or chemical. The simplest form of transfer is transfer of the commodity embodying technology. It often happens through exploration, warfare, and trade. Materials transfer requires little national capacity.

2. Design transfer requires national capacity. It involves the capacity to produce materials involved in the earlier stage. Blueprints for factories and designs of tractors can be imported, often with technical assistance. Seed can be produced, and certain technologies copied. A production capacity as well as technological capacity is required. A country often moves into this stage as it begins to develop its national capacity in research and extension.

3. Technology capacity transfer is the most complex and most difficult. This is a transfer of ability to generate new technology. It takes more than excellent training in a foreign country, according to their historical analysis of several countries, including the United States. It often requires that scientists be imported to work with well-trained national staff over extended periods.

The value of these models is to help donors and host countries determine the level of technology transfer that is relevant, so that expectations of probable performance can be realistic. Some of the most serious mistakes are those arising out of unrealistic expectations.