

**BARD 20-Year Review**  
**Economic Evaluation of Selected BARD Projects**  
**Executive Summary**

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***An endowment and 850 funded research projects***

The Binational Agricultural Research and Development Fund (BARD) was established in 1977. The budget derives from interest earned on a \$110 million endowment plus supplement funds, contributed equally by the Government of the USA and the Government of Israel. BARD's mission is to promote collaborative agricultural research and development for the mutual benefit of both Israel and the United States. Over the past 22 years, BARD has financed nearly 850 research projects on a wide variety of topics. Many of these projects have made significant contributions to the body of scientific knowledge. They have furthered our understanding of genetics and biological processes, and developed new techniques for managing pests and information. Several projects have also had significant commercial and economic impact. The purpose of this report is to assess those impacts.

***Ten projects selected for economic evaluation***

To select the projects evaluated in this report, 520 completed BARD projects were first screened for potential commercial impacts. Those with the most promising and potentially measurable economic returns were selected for further evaluation. The BARD management conducted the first round of screening, reducing the project pool to 60. Subsequent discussions among BARD management and the U.S. and Israeli

economic evaluation teams reduced this set of projects to 25 and finally to 10. These final 10 projects were subjected to detailed quantitative evaluation. Information was gathered from project scientists, external scientists, and representatives of relevant industries, and a cost-benefit analysis was conducted. The result indicated that, together, these 10 projects are expected to generate an estimated \$736M in economic benefits for the two countries by the year 2010. Table 1 presents the estimates for each project in each country.

**Table 1: Summary of the Results of the Economic Evaluation** (through 2010, US \$M)

Project Title	US Benefits	Israel Benefits
Growth Stimulation and Improved Feed Efficiency by Feed Restrictions in Chickens and Turkeys	187	16
Knowledge-Based Information Systems for Dairy Herd Management	0.7	30.6
Optimization of Chromosome Set and Sex Manipulations in Common Carp, <i>Cyprinus Carpio</i> L.	Negligible	7.9
Aeration and Stirring of Intensive Aquaculture Systems	150	3.1
Determination of Carotenoids and Capsaicinoids in Chile Peppers and Paprika: Genetic, Physiological and Horticultural Aspects	Low	47.3
Introgression of Resistance to Northern Leaf Blight into Sweet Corn with the Sugary Enhancer Gene: A Genetic and Epidemiological Study	1.0	0.5
Molecular Approaches to Strain Development and Determination of Role of Specific Gene Products in Biocontrol by <i>Trichoderma</i> spp.	Low	2.2
Tagging Plants with Tightly Linked RFLP Markers	Too early to tell	33.2
Development and Testing of a Method for the Systematic Discovery and Utilization of Novel QTLs in the Production of Improved Crop Varieties: Tomato as a Model System	1.2	158.5
Selective Breeding of Farmed Fish	95.8	Not evaluated
<b>Total</b>	<b>436</b>	<b>300</b>

### ***Economic benefits to the US and to Israel***

Looking across the ten projects, the distribution of benefits between the two countries illustrates differences in the size of the relevant industry within each country, the preferences of their consumers, the propensity of their agricultural producers to adopt new technologies and the rate at which research results are converted to marketable products. It also reflects the different regulatory environments of the two countries. Each of the projects is discussed briefly below.

### ***Poultry feed restriction improves profitability***

The poultry feed restriction technology developed by BARD has been widely adopted by poultry producers in the United States, but less so in Israel. With the U.S. poultry industry valued at more than \$21 billion in 1997, any efficiency gains in poultry production can have dramatic consequences – the expected U.S. benefits of this project were conservatively estimated to be \$187M. The smaller poultry market in Israel, together with a lower adoption rate led to lower expected benefits. Nonetheless, the \$16M in estimated benefits to Israel are considerable.

### ***Information systems for dairy herd management***

In contrast to the poultry project, Israeli dairy producers have been much more receptive to the information technology developed by BARD than have U.S. producers. This technology has created valuable efficiencies in Israeli dairy operations, but U.S. dairy farmers have opted for alternative production systems. As a result, expected benefits in the U.S. barely cover the cost of the project's budget, while Israeli benefits exceed \$30M.

### ***Sex manipulation and fish pond operation***

The difference in benefits from optimizing sex manipulation techniques of common carp is due to primarily to consumer demand – U.S. consumers simply do not purchase carp. U.S. consumers do purchase catfish, however, and they have benefited from U.S. producers' near 100% adoption rate of the techniques developed by BARD for aerating catfish ponds. Israeli carp farmers have been slower to adopt the aeration technology, but are expected to do so in the future. Together, these two aquaculture projects are expected to generate \$150M and \$11M in economic benefits in the United States and Israel, respectively.

***The US tilapia industry***

The project concerning techniques for breeding tilapia was evaluated the United States, but not in Israel. These techniques have played an important role in the development of the small but growing US tilapia industry. This project is expected to generate nearly \$96M in benefits by 2010.

***Paprika-based industry in Israel***

Neither the U.S. nor Israel is a major player in the world paprika market. The Israelis are expected to benefit substantially (\$47M) from the chili pepper project evaluated for this report, while U.S. producers and consumers are not. The primary factor behind this is the project's use of paclobutrazol, a growth regulator. Paclobutrazol is not registered for use on food products in the United States, but is in Israel. As a result, the Israelis have been able to capitalize on the horticultural aspects of the project while their American counterparts have not.

***Disease resistant sweet corn***

The introgression of northern leaf blight (NLB) resistance into sweet corn cultivars is expected to generate modest benefits in both Israel and the United States. The difference in expected benefits between the two countries is due to differences in the incidence of NLB. Even though the incidence of NLB is higher in the U.S., it is not a major problem in sweet corn in either country. This is reflected in the relatively low expected benefits of the project.

***Biocontrol of soil pathogens***

The use of *Trichoderma* to control soil borne diseases is expected to generate limited benefits in both countries. This is due primarily to the fact that the out-of-pocket costs of the *Trichoderma* products are commensurate with chemical controls and their efficacy under field conditions is still being tested. This project could, however, generate substantial benefits if the chemicals for which it is a potential substitute were to face stricter regulatory measures in either country.

***Discovery and selection of improved tomato varieties***

There is a significant difference in the expected benefits to each country for the two projects concerning genetic markers in tomatoes. A tomato seed company, based on the know-how acquired in the first project, was

established in 1994 and produces the improved seeds in Israel. The company sells tomato seeds resistant to several important diseases in both Europe and Israel. A European strategic partner joined the company a few years ago. The company's value now surpasses \$30M.

As a result of a second series of BARD projects, production of tomato seeds with improved quality and taste was initiated. The Israeli experts expect benefits of about \$160M. The U.S. experts interviewed regard the value of these markers much more conservatively, around \$2.5M. Their common refrain was that a lot of work has gone into identification of the markers, whose value to a U.S. commercial breeding program is yet to be evaluated. The expected U.S. benefits are discounted accordingly.

### ***Estimated dollar benefits***

Because the projects evaluated in this report were screened for their potential economic impacts prior to evaluation, the aggregate benefit estimates from the sample cannot be extrapolated to the entire population of BARD projects. Nonetheless, both countries have benefited considerably from these projects and many of the projects not evaluated certainly have positive commercial and economic benefits as well. Ignoring the potential benefits from other projects, the estimated \$736M in economic benefits from these ten projects (Table 1) greatly exceeds the total discounted value of the investment in the BARD Fund since its establishment in 1979. It should be noted that this does not include the substantial benefits (\$520M) derived from the five projects evaluated in the 10 year review of 1989. In addition, BARD has supported a significant amount of postdoctoral training, graduate students, workshops, international exchange and has contributed to the research infrastructure through the purchase of permanent laboratory equipment.