

**The Fallow Deer (*Dama Mesopotamica*) in the "Hai-Bar  
Carmel" Reservation: A Demographic Model Under  
Captivity Using Leslie Matrix and Cost- Benefit analysis.**

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The fallow deer (*Dama Mesopotamica*) , was in the past abundant throughout the fertile crescent of the Middle East, and is even mentioned in the Bible. It's

population declined dramatically during the 19<sup>th</sup> and 20<sup>th</sup> century due to extensive hunting and loss of habitat. During the 18<sup>th</sup> century the fallow Deer was considered an endangered species. The last one in this region was probably hunted in Jordan during 1922.

In 1955 2 German zoologists found the last herd in Iran. Soon after, breeding cores were established in Germany and Iran. In 1976 Israel started its own breeding core on mount Carmel with only 2 pairs brought from Germany. The idea behind it was eventually reintroducing the fallow deer back to nature as part of a grand plan of reintroduction. Four more females were brought to the breeding core from Iran as the Shah's regime was collapsing. In 1979 the breeding core was built of 2 males and 7 females, and the reproductive rate was 0.78 fawns/ year. It kept on going very well and so prosperous that it was decided to start with the reintroduction program during 1996 in the Kziv reserve in Israel. Today the Israeli Nature and Parks Authority considers the reintroduction of the Fallow Deer to nature a key project.

This research combines two aspects: biological and economical. That is to say, the project of reintroduction of the Fallow deer was examined on two aspects: is there an economic social justification for this project, and what is the current Maximum Sustainable Yield of the breeding core. Combining the economic and the biologic fields, enables looking at the reintroduction project in broad perspective.

The biological aspect examined the demographic dynamics in the breeding core. A computer model was built using a Leslie matrix in order to project the size of the breeding core in the future. By advanced computing it is possible to determine how many females in different ages could be removed without reducing the size of the current breeding core. That is the Maximum Sustainable Yield of females out of the breeding core which stands at 15%. It means that 10 females between the ages 2 up to 6 could be removed and reintroduced to nature with no pressure on the size of the breeding core. This computer model is flexible and could be used as a tool to keep on managing the breeding core.

The economical part examined the economical probability. It calculated the total cost of the project that reintroduces Fallow deer to nature. This involves the overall maintenance of the breeding core and reintroduction expenses, as compared with the public-social benefits. The financial estimate was conducted in two ways: to the Contingent Valuation Method (CVM) and the Travel Cost Method (TCM). The CVM looks for the Willingness To Pay declared in the questionnaires answered by the public. The TCM financially evaluates a site of interest, in this case the "Hai-Bar Carmel" where the breeding core is being kept.

The CVM results showed Willingness To Pay (WTP) higher than "0". Which shows us that the public significantly evaluates the non-use values (it is

common to differentiate the values of nature resources, which have no market, to use values and non-use values), especially for the existence values of this resource. Assuming that non-use values are not legitimate values in calculating the socio-public benefits, the lowest value of the reintroduction project was calculated. This value is based on use values only and estimated between 16,696,000 NIS (according the median calculation) and 23,815,175 NIS (according the average calculation).

The TCM results reveal that "Hai-Bar Carmel" nature reserve and the breeding core in it worth 12,061,990 NIS, extracting the Fallow deer value out of the total value shows a value of 2,388,979 NIS.

This research points out that the public in Israel highly evaluates the reintroduction project of Fallow deer and wants to ensure the conditions of this species existence in the ecological system. It also show that the social-public benefits, stemming from Fallow Deer reintroduction, are higher then the costs. This is the reason why, the investment in the reintroduction project wins the public support, it is economically effective and therefore worth the future investments and allocation of public resources.