



**CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY**

Name(s) Anna A. Chen	Project Number S0904
Project Title Efficacy of Insolation Conversion of Alternative Energy Sources	
Abstract Objectives/Goals Renewable, alternative energy sources such as photovoltaic and crop biomass (ethanol and biodiesel) are essentially solar energy conversion. If the efficacy of insolation conversion is modelled and calculated, then modern photovoltaic technology will prove to be more effective than any of the crop biomass sources. Methods/Materials This research is from a scientific point of view and does not consider the economics of building the production infrastructure, thus providing a theoretical upper limit of solar energy conversion efficiency by which to compare the long-term potential of each alternative. A model was constructed for each alternative for calculation, and data on the energy used and produced by each of the specific alternative energy sources was researched for input into the model. Results The results prove the hypothesis that photovoltaic technology is the most efficient for solar energy conversion at 15% to 20% for conventional solar cells. Sugarcane ethanol is a distant second at 0.183% followed by corn ethanol at 0.118% and soybean biodiesel at 0.0267%. Conclusions/Discussion This means that the land area for a photovoltaic farm is more than 100 times smaller than that required for a biomass farm to produce the same amount of energy. Not only is the land area smaller, but it also does not have to be arable or irrigated thereby promising a future that does not force us to choose between food and energy. Additional research and calculations indicate that photovoltaic farm area the size of California is sufficient to supply all the global annual energy demand.	
Summary Statement Solar energy conversion efficiency is modelled for biomass conversion to ethanol and biodiesel and compared with conventional photovoltaics.	
Help Received Father helped find scientific periodicals.	