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Faculty Advisor: Dr. Mohammad Motaher Hossain, Mechanical and Industrial Engineering

i. Motivation Polymeric films have been extensively used in packaging industries with applications include packaging film for frozen products, shrink film for transport packaging, food wrap film, packaging bags, fill and seal packaging film, and so on. Retaining structural integrity of food packaging films is a major concern for preservation of food quality and safety. A scratch on food packaging film can cause it to tear prematurely or compromise its barrier properties, which may ruin the product inside. Thus, significant research efforts are currently undergoing to study various fracture modes of food packaging films. However, difficulty in characterizing various fracture process zones *in-situ*

Faculty Advisor: Dr. Benjamin Turner, Agriculture and Natural Resource Management

i. Motivation Excessive sediment concentrations resulting from landscape scale erosion processes can adversely affect water quality and fish habitat and lead to environmental determination of surface water sources being impaired or threatened. The objectives of this project are to: 1) Build a demonstration instrument and teaching/extension protocol for rainfall-erosion simulation in the field or lab, and 2) Construct curriculum material for student and instructor use.

ii. Project Description Erosion and runoff are physical processes that must be managed like other agroecosystem processes. The erosion process is initiated by one of two forces: wind or water impact. Wind erosion can begin with light wind that rolls soil particles along the surface (surface creep) through to a strong wind that lifts and detaches large volume of soil particles (saltation) into the air to create dust storms (suspension). On the other hand, water erosion is initiated by the kinetic energy of rain drops to the soil surface, which if unimpeded, detaches and splashes soil particles making them available to be carried downslope in overland flow, rills, or eventually gullies. A rain droplet's kinetic energy is one-half of its mass times velocity squared. A soil's susceptibility to or risk of detachment during rainfall events can be evaluated by its "erosivity". The project aims to build an erosion demonstration and related curriculum material around agricultural and conservation efforts used to minimize risks of soil erosion.

iii. Research Training for the Participants Participants will learn about the trade-offs scientists must make in designing research laboratories and experiments, and considerations for communicating research results to non-scientific audiences. Participants will also triangulate and

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Task #3: Design different elevated solar panel systems to maximize the benefits of agrivoltaics. Based on selected location and agricultural land and product, the conceptual design of the elevated solar panel systems will be created with 3D modeling software, such as SketchUp.

iii. Research Training for the Participants Two teachers will work together in this project. One teacher will focus on Task #1 while the other teacher will focus on Task #2. Both teachers will work together on Task #3. Different cohorts will choose different agricultural lands or products.

Faculty Advisor: Dr. Kai Jin, Mechanical and Industrial Engineering

i. Motivation Improving supply chain efficiency and sustainability has been a challenge in the decision making process, especially to agriculture products which have unique features compared to other products. The usage of modern high-tech communication tools generated huge amount of data and information that can be used in the decision making process. However, there is lack of a systematic platform that can help the user visualize and effectively use the data.

ii. Project Description Engineering economic analysis methods and tools are part of the approaches to process the available big data on agriculture and generate valuable information to assist the decision making process. Discounted costs and benefits over a fixed period of time will be compared. The ratio of total benefits to total cost (benefit-cost ratio) or equivalently, the total net benefits (net present value) will also be evaluated. Furthermore, goal seeking and sensitivity analysis will be used to address the uncertainty in the problems. The steps to be used in this project to estimate the economic consequences of a decision can be summarized as: a) Define the problem