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Request for Funding

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Project Title: Valuating the economic benefits of grazing sheep in crop and orchard systems.

Project Duration: 18 months; approximately ending in summer 2010

Problem and its significance:

In recent years there has been a growing interest in and use of sheep for grazing crop residues and orchard floor vegetation. At a recent meeting, in early-November, University of California researchers, the California Wool Growers Association (CWGA) director, farmers and sheep producers discussed the issue of integrating sheep into farming systems and identified the need for research on many issues that currently stifle an expansion of this use of sheep. Some issues that will require long-term research projects and large funding pools include pathogen prevalence and survival, nutrient cycling and soil quality. A more immediate need that was also identified is to quantify the direct benefits that farmers and sheep producers realize when sheep are strategically integrated into farming systems. Quantifying these direct benefits is a relatively short-term project that we propose to address with funding assistance from the California Walnut Board along with other sources.

One of the obvious advantages to sheep producers that graze sheep on crop residues and orchard floor vegetation is access to a large forage resource, which is especially valuable during periods of the year when rangelands are non-productive. Farmers also recognize direct benefits by strategically using sheep to remove unwanted crop residue and other vegetation which reduces tractor and equipment use, labor, fuel and herbicides. Farmers of organic orchards are especially interested in this use of sheep due to the high expense of other weed control methods. And yet another issue that will likely affect all agricultural operations in the near future is the carbon footprint for each farming activity and for each agricultural product that is grown. As carbon accounting becomes a predominant factor in agricultural decision making, farmers and livestock producers need to know not only the dollar cost for each practice, but also the carbon cost.

The integration of sheep into farming operations is growing, as well as curiosity and interest from both sheep producers and farmers. However, there is little information available to guide the decision making process. We see the first step as providing farmers and sheep producers with the tools that will help them make informed economic and environmental decisions about integrating sheep with farming operations. We propose to develop a cost-benefit analysis for the use of sheep in farming systems. The analysis will be based on information we will gather through detailed interviews with farmers and sheep producers currently engaged in these integrative practices and field measurements. A full accounting of the costs and benefits will also include the measurement of forage quantity and quality, changes in crop pest pressure and the level of copper present on forage following spring applications. Copper is toxic to sheep at levels above 25 ppm in their total diet. We will also attempt to determine the carbon footprint associated with sheep grazing compared to the normal farming practices that can be replaced or reduced with grazing.

This proposed project will address an important initial component of a larger research effort that many UC researchers and CWGA will pursue along with cooperating farmers and sheep producers in California. In addition to this project, our team, which also includes Drs. Bruce Hoar and Robert Atwill with UC Davis Veterinary Medicine and Dr. Jenny Broome, will pursue large funding opportunities (~ \$ 250,000) to research the prevalence and survival of fecal pathogens from sheep grazing and direct manure applications in orchards systems under varying management practices.

Objectives:

We propose to determine the economic costs and benefits to sheep producers and farmers when sheep grazing is integrated into farming systems for the purpose of reducing and/or removing unwanted crop residue and vegetation. The timeline for the project of 18 months is based on the time a current UC Davis graduate student would need to complete this project as part of a Master's thesis.

Specific objectives:

1. Communicate with allied industry representatives, UC Cooperative Extension advisors, resource conservation districts and other agricultural support groups to establish a list of farmers and sheep producers to interview.
2. Create interview questions designed to accurately gather necessary information.

3. Contact and schedule interviews with farmers and sheep producers currently engaged in practices that integrate sheep and farming systems. The exact number of interviews that will be conducted is not known, but every effort will be made to maximize the number of contacts.
4. Conduct face-to-face interviews with each farmer and sheep producer. Phone interviews will be used if a face-to-face meeting is not possible.
5. Compile and analyze interview responses to develop costs and carbon use associated with each farming practice and sheep grazing.
6. Collect field data from farms located in Yolo and Solano Counties that are integrating sheep in their farming operations.
7. Correlate the forage value (yield and quality) of crop residues and vegetation on vineyard and orchard floors to specific farming parameters such as crop type, crop management, tree/vineyard density and canopy cover.
8. Project information will be communicated through the graduate student's Master's thesis, peer-reviewed articles published through the University of California's Division of Agriculture and Natural Resources, Cooperative Extension and commodity group newsletters, and presentations at commodity group meetings/workshops.

Plans and Procedures:

Critical to the execution of this project is a person willing to dedicate their time to shepherd the project from beginning to end. Alexandra Towns is a new UC Davis graduate student in the International Agricultural Development program and has decided to pursue this topic for her Master's thesis. The desire to assume this topic for a Master's thesis is a great opportunity to direct much more attention and detail to the topic than would otherwise be devoted through an intern or paid staff.

The project will begin by tapping into an extensive network of professionals working in the California agricultural industry to develop a list of farmers and sheep producers that are currently using sheep in farming operations or are interested in this use of sheep. We will request assistance from UC Cooperative Extension livestock advisors, CWGA staff and board members, resource conservation districts, county agricultural commissioners and other commodity boards in identifying potential interview candidates. We are confident that we can find at least 30 farmers and ranchers to interview. While interviews are being scheduled, the interview questions will be created through an iterative process involving the graduate student, Cooperative Extension advisors, CWGA and UC Davis faculty.

Interviews of the farmers and ranchers will be conducted by the graduate student throughout the year of 2009. During the appropriate times of the same year, forage and crop residue samples will be collected from various farming systems to determine the yield and quality of vegetation that can potentially be consumed by sheep. Other farm management parameters and field conditions will be measured and recorded to create predictive correlations to forage/residue yield and quality. Vegetation samples will be analyzed at UC Davis to determine fiber, protein and total digestible nutrients (TDN). Forage and residue values will be based on the market rate for other forages with similar nutritional values. Copper levels in orchard floor vegetation will be determined from vegetation samples collected from at least 3 orchards at 1, 2, 4, 8, 16, 32 and 64

days following copper applications, and one sample prior to the application. The samples will be submitted to the DANR Analytical Laboratory for copper concentration determinations. Detecting changes in pest pressure, primarily brown rot in prune orchards, as a result of grazing will be difficult to accomplish in the proposed time period for this project, however we can measure changes in prune mummies that contribute to brown rot by arranging replicated grazing and control blocks in a prune orchard. We can also measure the removal of low-wood fruit by the sheep that may increase total fruit quality.

Interview information and on-farm data will be used to create cost-benefit models that can be used to compare sheep grazing to the normal vegetation/residue management practices. We anticipate that all the necessary information will be collected by the end of 2009 and publications will be written by mid-2010.

Dissemination of the project's results is identified as one of our primary objectives. In addition to the Master's thesis will employ several media to communicate the findings to the target audiences. The team members will work collaboratively to develop peer and non-peer reviewed publications and use each team members' communication network to disseminate the information. Extension methods expected from this project include:

- Peer-reviewed publication such as California Agriculture and/or an UC ANR 8000 series publication will provide the scientific basis for the technique in a practical and understandable format for potential practitioners and beneficiaries.
- Commodity group meetings will provide targeted opportunities to disseminate the project information to the agriculture industries that will potentially benefit from the research.
- County newsletters and websites will provide easy access to the findings and recommendations from this project.

Budget:

The overall budget for the project likely requires more funds than one individual commodity board can or is willing to provide. In addition to the California Walnut Board, we will seek funding from other commodity boards, California Farm Bureau Federation and organizations providing grant funding for sustainable agricultural research. The California Sheep Commission has already pledged \$5,500 to the project. The primary budget expense for the project is graduate student funding, which includes student fees and a monthly research assistantship salary for 18 months (see budget table). **We are asking the California Walnut Board to provide a portion of the funding that the Board determines appropriate for the proposed project, but we would like to at least receive an amount that will cover fees and salary for one quarter, which equals \$ 9,012.** The overall budget for the project is described in the following table.

Item	Description	Expense
Salary, Research Assistantship for 18 months	18 months @ \$1,821/month	\$ 32,778
Student fee remission	4 quarters @ \$3,540/quarter	14,160
Laboratory analyses	130 samples at \$15/sample	1,950
Travel to visit farmers/ranchers (estimation)	3000 miles @ \$0.58/mile	1,740
Total		\$ 50,628

