Sustainable Agriculture Farming Systems Project

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Economic Viability of Organic and Low-Input Farming Systems in the Sacramento Valley

Organic and low-input farming systems must be productive and profitable to be adopted by farmers. Research at the Sustainable Agriculture Farming Systems (SAFS) Project demonstrate the importance of premium prices and the need for cost-effective and reliable fertility and weed management practices for ensuring economic viability. Farmers transitioning to organic and low-input production can reduce risk by anticipating potential problems and selecting crops which perform well under such

Introduction

A fundamental goal of alternative agriculture, including organic and low-input farming systems, is to reduce non-renewable resource use and environmental degradation while maintaining productivity and profitability. The Sustainable Agriculture Farming Systems (SAFS) Project, established on an 28 acre site in 1988 to study the transition from conventional to low-input and organic farming practices in California's Sacramento Valley, is evaluating the economic viability of organic and low-input farming in the region. The SAFS project compares four different farming system treatments. The organic, low-input, and conventional-4-year (conv-4) systems are four-year rotations including tomato, safflower, corn, and bean. Wheat is double-cropped with bean in the conv-4 system, while an oats/vetch biculture or lupine crop has been substituted for wheat in the organic and low-input systems. The fourth treatment is a conventional-2-year rotation (conv-2) of tomato and wheat. All farming systems use "best farmer management practices" which are determined through consultation with area growers and farm advisors cooperating on the project.

Economic Measurements

The economic viability of each farming system is quantified by estimating costs, returns, and profits of a hypothetical 2000 acre farm using SAFS inputs, yield results, and local prices for materials and commodities. Total costs include operating costs (all production practices including planting, pest management, harvesting, etc.), cash overhead (land rental, property taxes, and other business expenses), and non-cash costs (depreciation and opportunity costs for equipment, irrigation systems, tools, and buildings). Gross returns are generated from the average plot yields multiplied by the commodity farm-gate price. The farm-gate prices are obtained from local and regional buyers at the time of harvest. Gross returns for the organic system are calculated two ways, first with conventional

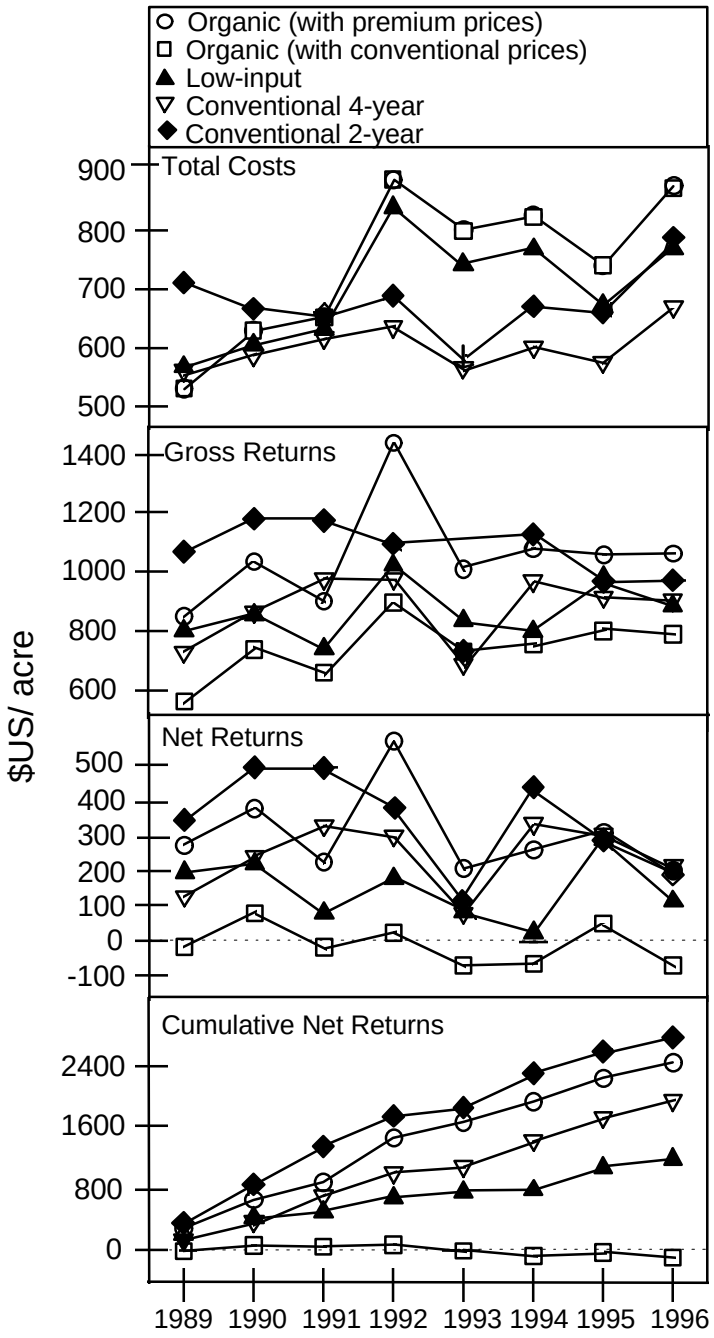

Figure 1: SAFS whole-farm total costs, gross returns, net returns, and cumulative net returns ($US/a) calculated for the 4 farming system treatments, 1989-1996. Numbers for the Organic system are presented with and without premium prices

prices and second with premium prices for organic commodities, to examine the
economic viability of both markets. Net returns (profits or loss) are calculated by subtracting total costs from gross returns.

Economic Comparisons

Here we consider the economics of the 4 farming systems from 1989-1996 *(Figure 1)*. The most profitable farming system over the 8 years was the conv-2 system due to the greater frequency of tomato in that rotation. This system averaged $340/acre in net returns over the 8 years. Among the 4-year rotations, the organic system with price premiums was most profitable, averaging $300/a, while the organic system without price premiums was unprofitable, averaging a loss of $13/a. The conv-4 system was the second most profitable 4-year rotation, averaging $238/a, while net returns in the low-input systems were $145/a.

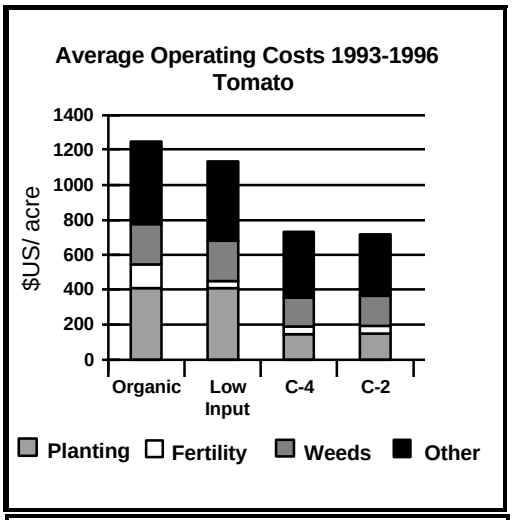

Figure 2: Average tomato operating costs 1993-1996; planting, fertility, weed management, and other costs associated with production of organic, low-input, conventional 4-year, and conventional-2 year farming systems .

A comparison of operating costs among the 4 tomato cropping systems from 1993 to 1996 shows that planting costs in the organic and low-input systems were nearly 3 times greater than those of the conv-4 and conv-2 systems *(Figure 2)*. Using transplants rather than direct seeding was the most important cost difference in the organic and low-input systems. Other factors which contributed to higher costs in the organic and low-input systems were the use of cover crops, purchased composted manure, and higher hand- hoeing costs. Fertility management costs in the organic system were about 60% higher than those of the other farming systems *(Figure 2)*.

Tomato showed the greatest range in net returns (profits and losses) and contributed the most to profits in all farming systems except for the organic system without price premiums. Tomato crops in the conv-4, conv-2 and organic (with premiums) systems were profitable in all years of the study, with average net returns of $698/a, $658/a, and $858/a, respectively. Low-input tomato crops were profitable in 6 of the 8 years, but averaged only $245/a. Without price premiums, the organic system would have been profitable in only 4 of the 8 years and averaged a loss of $28/a.

Following the tomato crop, bean and corn crops were generally the next most profitable components of the 4-year rotations. Bean crops were profitable in the 3 farming systems in all years, except in the organic system without premiums, in which net returns were positive in 5 of the 7 years. Beans were clearly most profitable in the organic system with premium prices, averaging $261/a. High premium prices for organic beans contributed significantly to profits in the organic system. The relatively low profitability of beans in the conv-4 system was due to higher operating costs primarily in fertility and pest management.

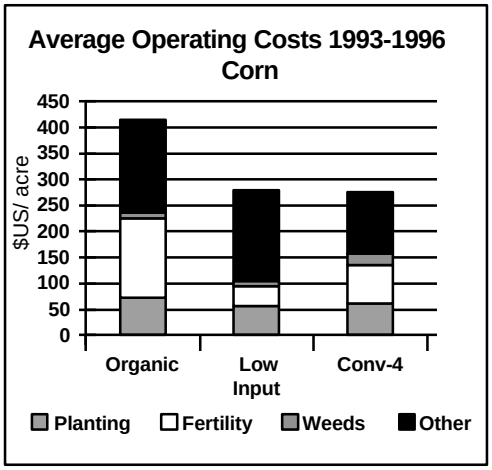

Figure 3: Average Corn operating costs 1993-1996; planting, fertility, weed management ,and other costs associated with production of organic, low-input, and conventional 4-year farming systems .

Corn was most profitable for the low-input system due to relatively moderate costs and high yields. Net returns in this system averaged $154/a. Average annual profits for corn in the organic (with premiums) and conv-4 systems were $112/a and $101/a respecitvely. High operating costs in the organic system relative to the other systems can be attributed to fertility costs, which averaged five times higher than the low input system and twice as high as the conv-4 system *(Figure 3)*. Corn in the organic system without premium prices averaged a net loss.

Safflower and the winter grain/legume were generally the least profitable crops in the rotations. Safflower was profitable in the conv-4 and organic (with premiums) systems in 6 of 8 years and averaged net returns of $89/a and $48/a, respectively. However, due to crop losses in 1992, safflower crops in the low-input and organic (without premiums) systems, despite being profitable in 5 of the 8 years averaged a loss in net returns. Wheat in the conv-4 and conv-2 systems was profitable in 4 and 5 years of the study, respectively, and averaged profits of $21-24/a. Similarly, the winter grain/legume crop in the low-input system (lupine or oats/vetch) was also profitable in 5 of 8 years and averaged $101/a. Because this crop was often used as a green manure in the organic system it produced positive net returns in only 2 of 8 years and averaged losses of $46/a with premiums and $64/a for the organic system without premiums.

Implications For Adoption

The dependence of organic tomato production on price

prices should remain high. However, widespread adoption of organic methods would eventually lead to lower prices. It should be noted that the price for organic tomatoes declined from $105/t in 1989 to $73/t in 1996. Because of this we have some concerns regarding the use of transplanting, a costly practice, in the organic and low-input systems and the dependence upon imported, animal-manure compost in the organic system. If premium prices continue to decline the use of these production practices would have to be reconsidered. Assumptions regarding the source and cost of manure can have a dramatic effect on the outcome of economic comparisons. All manure inputs in this study were assumed to be purchased from off-farm sources. If, instead, disposal costs were assumed for the manure source, fertility management costs in the organic corn and tomato systems obviously would be less.

Bean yields and profits over the 8 years indicate short-term and long-term possibilities for low-input and organic systems. The economic performance of organic beans with and without premium prices make this a good candidate as a transition crop. Relatively low production costs and high premium prices have made this crop highly profitable in the organic system. Even without premium prices, the organic bean system was more profitable than the conv-4 system over the 8 years. However, heavy weed pressure in some years of the study raise concerns over the future adequacy of nonchemical weed management in the organic system. The low-input system, which uses herbicides sparingly, may be the most sustainable over the long-term.

Based upon the SAFS study, safflower appears to hold limited potential in organic and low-input farming systems in the Sacramento VaIley. In 1992, the complete loss of this crop which typically yields only marginal economic returns in good years, resulted in economic losses which could not be recouped in the low-input and organic (without premiums) systems over the other 7 years of the study.

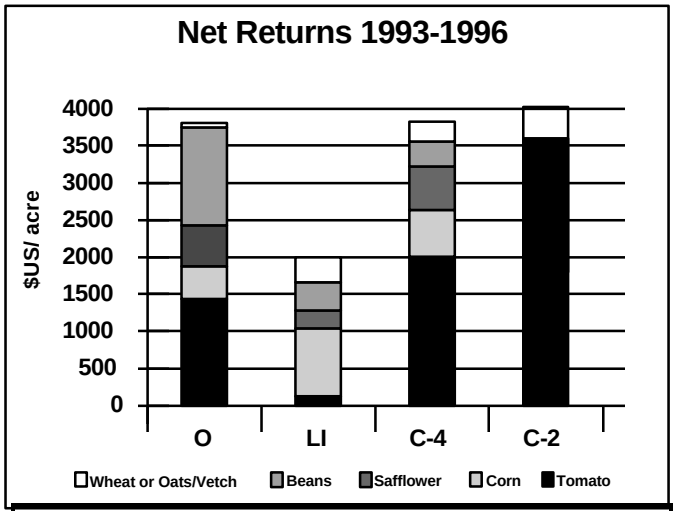

Figure 4: Economic net returns are calculated for each system by subtracting the cost of production from the gross returns of organic (with premium market prices), low-input, conventional-4 year and conventional 2-year farming systems. The conv-2 year system, rotating tomatoes and wheat, was the most profitable system in accumulated net returns 1989-1996, due to the greater frequency of tomato in that rotation.

However with the addition of premium prices, this crop was marginally profitable over the 8 years in the organic system.

The economic performance of the winter grain/legume crop showed substantial variability among farming systems largely because of the differences in crop species and management options. Wheat, a common crop in the Sacramento Valley, provided only marginal profits for the conv-4 and conv-2 systems. The winter grain/legume crop in the organic system was unprofitable as a cash crop because it was harvested and sold in only 5 of 8 years. In the other 3 years it was incorporated as a green manure preceding beans and economic costs were included, but the returns not directly measured. By contrast, the winter grain/legume crop in the low-input system was profitable largely because it was sold as seed, hay, or green chop in 7 of the 8 years of the study. On farms with livestock within a short transportation distance, this cropping system could have an important role in producing feed, but without livestock nearby its value is somewhat questionable.

Conclusions

The whole-farm profit comparisons demonstrate the economic incentive for a 2-year rotation with tomato; a common cropping strategy in the Sacramento Valley. The primary concerns about this system are the potential for increased disease pressure and/or degradation of soil structure. Current research at the SAFS site is focusing on these problems and their associated costs. Among the 4-year rotations in the SAFS study, the organic system with premium prices has been the most profitable. Thus, it is a potentially viable farming system option for the Sacramento Valley with the current market demand for organic products. However, this system's dependence on price premiums leads to some concern over its long-term economic viability as more growers transition to organic methods. Yield comparisons indicate that the transition to organic production may be somewhat problematic for crops with high N demands, such as tomato and corn. by contrast, bean appears to be a reliable and profitable crop during the transition. The conv-4 farming system generally has the lowest costs but ranks third in profitability. The low-input system performs well agronomically but has relatively high costs. Among the low-input cropping systems, corn demonstrated clear agronomic and economic advantages over conventional production methods. *(See SAFS Project Newletter Vol.1 Issue 2)* Furthermore, environmental advantages may accrue from increased adoption of this cropping system throughout the region. Current research at the SAFS site is being directed toward developing cost effective fertility and weed management options for organic and low-input farming systems based upon improved understanding of nitrogen dynamics and weed ecology.

Visit SAFS website:

http://agronomy.ucdavis.edu/safs/home.ht m

SAFS Project Participants

SAFS Principal Investigators and Cooperators

Crop Production	***Steve Temple***
Economics	***Karen Klonsky***
Economics	***Pete Livingston***
Nematology	***Howard Ferris***
Plant Pathology	***Ariena vanBruggen***
Soil Microbiology	***Kate Scow***
Plant and Soil Fertility	***Carol Shennan***
Soil Fertility	***Willi Horwath***
Soil & Water Relations	***Jeff Mitchell***
Weed Management	***Tom Lanini***

SAFS Technical Staff

Research Manager	***Sean Clark***
Crop Production Manager	***Don Stewart***
Information Specialist	***Kelly J. Brewer***

SAFS Technical Advisors

UC Cooperative Extension Farm Advisors
Yolo and Solano Counties
Tom Kearney and Gene Miyao

Growers
Jim Durst, Bruce Rominger and Ed Sills

SAFS Newsletter Staff

Contributing Writers	***Karen Klonsky*** ***Sean Clark*** ***Pete Livingston***
Managing Editor	***Kelly J. Brewer***
Graphic Design	

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Sustainable Agriculture Farming Systems Project
Dept. of Agronomy and Range Science
University of California, Davis
Davis, CA 95616