Reclaiming Marginal Farmland and Bringing Under Cultivation Raw Land: Costs and Benefits for the Central Valley in the 1990's

By Jim Rich, DPLA, DWR. August 11, 2000.

The following information on cultivating marginal and/or previously-uncultivated farmland is the result of a quick literature search. It was frustrating to see how few of the articles contained specific cost information:

Poorly-drained, crusted, and compacted soils can be improved and enhanced by adding organic matter to the farmland. But that can be an expensive, time-consuming process, resulting in significant, but temporary improvements in soil structure and crop yields. For instance, to increase the organic matter in the soil covering an acre of poor-quality farmland by only 5 percent would require over 20 tons of manure and compost.

Fortunately, there is a new soil conditioner, AgriGator, that promises faster, longer-lasting results at a lower cost. During a recent field trial on marginal garlic ground in the Lost Hills WD of Kern County, a $50/acre investment in AgriGator resulted in a 10 percent yield increase, which resulted in a reported profit increase of $664/acre. [Above text based on "Restructuring Plan", *California Farmer*, mid-March, 1998, p. 12.]

"Poor soil structure creates water penetration problems for farmers in the San Joaquin Valley ... Amending the soil with calcium [in the form of gypsum] will improve conditions." Studies have shown that applying gypsum to poor soils has increased water infiltration, and thus yields in wine and table grape vineyards, a cotton field, and a walnut orchard. In the orchard, after gypsum was applied, the average yield increased 200 pounds per acre, bringing in $156/acre more revenue. The cost of the gypsum treatment: $95/acre. [Above text based on "Gypsum improves water penetration in poor soils", *Ag Alert*, 1/8/97, p. 4.]

In 1986 a walnut orchard was planted on marginal farmland at the Nickels Soils Laboratory, using a hedgerow arrangement with drip irrigation. Before planting, half of the orchard land was "slip plowed to 6 feet in depth, on 10-foot centers." Strangely, that half showed lower yields over the long run than the other half. [Above text based on "Growers look to marginal soils for walnut hedgerows", *Ag Alert*, 5/8/96, p. 12.]

Almost three years ago DWR economists visited the Sierra Foothill Research and Extension Center in Browns Valley. There they saw newly-planted and well-established apple, apricot, nectarine, pecan, peach, and chestnut orchards. That rolling

hill land had relatively thin and infertile soils. However, I have yet to find information on the cost to bring that former dry rangeland under cultivation, or even if the new orchards are producing a high enough yield to be considered profitable.

"Using a soil amendment to improve water penetration and create a better growing medium for plants in marginal soils has been a common practice in California. ... A liquid polymer - polymaleic acid - is a newer and lesser known material ... Researchers who have tested the polymer say it helps improve soil structure and increase water penetration ..." [Above text based on "Water Savers," *California Farmer*, May 1994, p. 14.]

In Merced County recently marginal land that had previously been used as dryland pasture was converted to an alfalfa field, with the help of a center pivot sprinkler irrigation system. "The cost of installing the center pivots is about $400 an acre, which compares favorably to the more than $1,000 an acre that it would cost to install solid set sprinklers or a hand-moved irrigation pipe system, ... Costs for the pumps and infrastructure to get water to the system sent the total price tag for the project to $700 an acre."

An irrigation company president [Mr. Bronson] said, "... a center pivot system would be ideally suited for marginal type ground or in areas such as the foothills where there isn't enough water to irrigate 100% of the land ..."

Mr. Bronson is designing another pivot system for another Merced County site, this one on rolling land in the eastern foothills that will be planted to alfalfa. "At that site, two center pivots will be used to irrigate 632 acres of land that has always been dryland farmed. ... That project could be installed for about $650 an acre, which would include the cost for drilling a well, installing a pump and moving an electrical line out to supply power for the system, ..."

Another authority on center pivots states, "With a center pivot in place at about $400 an acre, with a 10 to 20-year-life span, you can put one on this marginal [rolling] land and raise tremendous crops." [Above text based on "Pivotal Decision", *California Farmer*, 11/97, pp. 8, 9, 22, and 60.]

A crust-breaking device was recently developed by UC researchers to improve water infiltration into furrows. It can be used on fields were soil crusting and compaction impede water penetration into the soil. It is a "torpedo-shaped, winged crust-breaking device." Unfortunately, I could find no information on how much it costs to build or use such a device. [Above text based on "Crust breaking device ...", *California*

Agriculture, 9-10/97, pp. 21, 22.]

Marginal farmland can be turned into land suitable for vineyards and orchards through the use of certain soil amendments. In eastern Madera County there are 1,750 acres of saline land farmed by Joe Mendes for Woolf Enterprises. Prior to 1995 that land grew mainly grains and alfalfa, using poor-quality irrigation water. Starting in 1995 Mr. Mendes oversaw the reclamation of this land. He added a ton of sulfuric acid and a ton of soil sulfur to each acre. He ran sprinkler sets for 48 to 96 hours to leach out salts. He used an injection pump to add the sulfuric acid, which otherwise would be dangerous to handle. To convert the wells to inject the sulfuric acid cost about $2,000 per well. It appears that nine wells are planned to be converted for the 1,750 acre farm. [No other cost information was given in the article.]

After the reclamation was completed, the planting of 1,200 acres of premium varietal wine grapes and 550 acres of almonds began. [Above text based on "Rapid reclamation turns marginal land into vineyards and orchards," *Cal.-Az. Farm Press*, 8/2/97, pp. 12, 13, and 18.]

Drip irrigation using new drip tape systems has allowed Dick Donati, a Santa Maria Valley vegetable grower, to farm marginal farmland which once would never have been considered for vegetable production. For instance, Mr. Donati "took over some hilly ground that had previously been a dairy, land he never would have been able to use with furrow or even sprinklers."

"'With the advances in irrigation technology and soil fertility we can grow crops on marginal ground our ancestors would have not considered for vegetable production.' Donati says that about 250 of his acres would not be in production, or would be in lower value crops such as pasturage, without drip irrigation."

"As well as allowing him to produce vegetables crops on rolling ground, drip allows him to utilize poor quality soils that require steady doses of nutrients. And those fields can be converted into fertile ground over the years." [Above text based on "Tape player," California Farmer, 1/98, pp. 10, 11, and 24. The article contained no information on costs.]

Sometimes farmers run afoul of environmental rules and regulations when they convert, or try to convert, marginal or uncultivated land they own into productive farmland. Legal costs and costs to fill out extensive government paperwork can add to the cost of bringing land into production. Land that is completely dry for most of the year, and is soggy for a month or

two in the winter, is sometimes classified by the federal government as a wetland. This is seen in the following article:

"Farmers suffered a 'setback' in federal court ... when a judge fined a landowner [$1.5 million] for plowing his land. Prosecutors had charged the landowner with destroying wetlands by 'deep ripping' a four-acre pasture in northern San Joaquin County to convert it to vineyards and orchards. ..." [Above text based on "Plowing technique ruled a violation," *Food and Farm News*, 11/10/99.]

The following cost information is from recent UCCE Crop Budgets:

From: UNIVERSITY OF CALIFORNIA - COOPERATIVE EXTENSION 1998 SAMPLE COSTS TO ESTABLISH AN ALFALFA STAND AND PRODUCE ALFALFA HAY Sacramento Valley Flood Irrigated ...

Establishment Costs. The cost to establish an alfalfa stand is the sum of the cash expenses required to prepare the land, plant and grow the alfalfa through the first year until a yield is produced, interest on operating capital, cash overhead, minus any returns. In this case, it is only through the first year up to the first harvest. Establishment cost per acre is ....$321 per acre ,.. To obtain [annualized] stand establishment cost for an average production year, the Net Total Cost/Acre for the establishment year ... is divided by 4 years.

From: 1998 UNIVERSITY OF CALIFORNIA - COOPERATIVE EXTENSION SAMPLE COSTS TO ESTABLISH AN ALMOND ORCHARD AND PRODUCE ~ ALMONDS ~ NORTHERN SAN JOAQUIN VALLEY MICRO-SPRINKLER IRRIGATION ...

Irrigation System. The orchard is irrigated using a micro-sprinkler irrigation system. Water is delivered to the orchard from the district ditch and pressurized with a pump into the micro-sprinkler irrigation system. The life of the irrigation system is estimated at 25 years. The irrigation system is installed before the orchard is planted. ...

Site Preparation. This orchard is established on ground that has been previously planted to field and row crops. The land is assumed to be well drained and either a class I or II soil. ...

TOTAL CASH OVERHEAD COSTS	291	289	289	289	289	289
TOTAL CASH COSTS/ACRE	2,139	834	1,245	1,647	1,730	1,772
INCOME/ACRE FROM PRODUCTION			560	1,120	2,240	2,520
NET CASH COSTS/ACRE FOR THE YEAR			2,139	834	685	527
PROFIT/ACRE ABOVE CASH COSTS					510	748
ACCUMULATED NET CASH COSTS/ACRE	2,139	2,973	3,658	4,185	3,675	2,927

...

Non-Cash Overhead Costs:
Capital Recovery Cost:

Shop Building	41	41	41	41	41	41	
Land @ $7,500/Acre	617	617	617	617	617	617	...
Sprinkler Irrigation System	99	99	99	99	99	99	...
TOTAL ACCUMULATED NET COST/ACRE ...							7,974

NON-CASH OVERHEAD:
Per producing -- Annual Cost --
Investment Acre Capital Recovery - 7.81% Interest Rate ...

Land	7895	617	617	...
Sprinkler Irrigation System	1074	99	99	...
Almond Orchard Establishment	3635	351	351	...
TOTAL COSTS/ACRE			3003	

From: Establishment and Production Costs
Lemons San Diego County, 1998 ...

Detailed costs for lemon grove establishment and production in San Diego County are presented in this study. The hypothetical grove used in this report consists of a total of 20 acres, 18 of which are being either newly established, or replanted, and the remaining two acres are in buildings and roads. ...

4. ESTABLISHMENT CULTURAL PRACTICES

This grove is established on ground that is currently open land. The land is assumed to be slightly hilly with sandy loam soils that are adequately drained and moderately fertile. The practices described below represent only the hypothetical grove in this study. ...

Land Preparation: In this operation, the land is cleared of trees and leveled using a bulldozer tractor with a land scraper attachment. This is done using a custom operator at $800 per acre. ...

Planting: This study assumes that lemons are of Eureka variety and that 108 trees per acre are planted by contract labor. The cost is shown in Table 1.

Table 1. U.C. COOPERATIVE EXTENSION
SAMPLE COSTS PER ACRE TO ESTABLISH A LEMON GROVE
SAN DIEGO COUNTY - 1998 ...

TOTAL COST FOR THE YEAR	1,347	1,561	1,687	1,810	1,886	
INCOME FROM PRODUCTION	0	0	1,160	3,132	7,975	
TOTAL NET COST FOR THE YEAR	1,347	1,561	527	-1,322	-6,089	
TOTAL ACCUMULATED NET COST	1,347	2,908	3,435	2,113	-3,976	...

U.C. COOPERATIVE EXTENSION
COSTS PER ACRE TO PRODUCE LEMON SAN DIEGO COUNTY - 1998 ...

NON-CASH OVERHEAD: ...
Per producing Annual Cost Investment acre Capital Recovery ...

Irrigation SDC	3,433	199	199	...
Land - SDC Lemons	11,550	0		

SDC Lemon Estabmnt 8,539 551 551 ...

From: **Prepared by Keith Mayberry, Farm Advisor**
MATURE GREEN TOMATOES, BUSH GROWN PROJECTED PRODUCTION COSTS 1998-1999 for Imperial County, California . . .

OPERATION	Cost	Materials	Hand Labor	Cost ...
LAND PREPARATION				
Stubble disc	20.00			20.00
Subsoil	35.00			35.00
Disc 2x	11.00			22.00
Landplane 2x	11.50			23.00
Border, cross check & break border	16.25			16.25
Flood irrigate Water 1 ac/ft	13.50	1	7.50	21.00
Fertilizer double spread 8.00	500 lb. 11-52-0	60.00		68.00
Disc 2x	11.00			22.00
Triplane	10.50			10.50
List beds 60"	19.00			19.00
TOTAL LAND PREPARATION				**256.75** . . .
GROWING PERIOD ...				
Install drip irrigation	Drip system	500.00	10 75.00	575.00

The above excerpts from four recent UCCE Crop Budgets show the wide range in cost to bring various types of land into various degrees of agricultural production. The first budget predicts that it would cost only $321 per acre to establish a typical flood irrigated Sacramento Valley alfalfa stand in 1998. In this case the previous condition of the farmland is not know. It was probably growing lower-valued field crops. It could even have been simple grazing land or dryland grain land.

The next budget is set in 1998, and shows the costs to establish a micro-sprinkler irrigated almond orchard in the San Joaquin Valley. The well-drained land has Class I or Class II soils, and is worth $7,500/acre, excluding the value of the yet-to-be-planted almond orchard. The irrigation system is valued at $1,074 per acre. It costs an estimated $3,635 per acre to establish the almond orchard on land that had "been previously planted to field and row crops."

The third budget is set in 1998, and shows the costs to establish a lemon grove in the San Diego County. Before the grove was planted, the land was "open land. The land is ... slightly hilly with sandy loam soils that are adequately drained and moderately fertile." This "open land" could be land that was growing row crops before, or a vineyard or another type of orchard. Or it could have been uncultivated land. The fact that in order to be prepared for planting in lemon trees the land had

to be "cleared of trees and leveled" implies that the land was previously raw, wooded land or an old orchard.

The irrigation system for this new lemon grove cost $3,433 per acre to install. The land without the grove is valued at $11,550/acre. It cost a total of $8,539/acre (including non-cash costs), to establish the lemon grove.

The final crop budget is for 1998-99 fresh market tomatoes in Imperial County, and gives an estimate of the total cost to install a drip irrigation system on vegetable land: $575/acre. If we assume that the costs to take raw, uncultivated Imperial Valley land and turn it into truck crop land are at least equal to the costs to take cultivated Imperial Valley vegetable crop land and prepare it for planting tomatoes, then this crop budget provides additional useful information: $257/acre or more to prepare the land for planting, plus $575/acre to install drip irrigation, for a total cost of $832 per acre.

In conclusion, much usually needs to be done to take raw, uncultivated land in California and turn it into productive farmland. Even with the help of modern technologies, considerable time, effort, and money are usually needed to take marginal, poor-quality farmland and turn it into prime, first-rate farmland, capable of growing higher-valued crops. In the few examples discussed above, we saw that:

o A $50/acre investment in a soil conditioner applied to marginal Kern County garlic land resulted in a 10 percent yield increase.

o A $95/acre investment in gypsum treatment increased the average yield of a San Joaquin Valley walnut orchard with poor soils by 200 pounds per acre.

o A $700/acre investment in a center pivot irrigation system and its associated pumps and infrastructure helped turn a Merced County dryland pasture into an alfalfa field. [To this cost we should also add the cost to establish the alfalfa stand, which was $321/acre for a Sacramento Valley alfalfa field.]

o A $650/acre investment in a center pivot irrigation system and its associated well, pumps and power line will soon help turn dryland grain or grazing land in the eastern Merced County foothills into an alfalfa field, if all goes as planned. [With a $321/acre cost to establish the alfalfa stand, the total cost would be $971 per acre.

o An $18,000 investment was planned in 1997 to convert nine wells and their pumps to be able to handle injected sulfuric

acid, so as to irrigate 1,750 acres of wine grapes and almonds on poor quality farm land which previously grew mainly grains and alfalfa. Although this would cost only $10.29 per acre, other major investments in soil amendments, equipment, and labor would also be required to improve this farmland.

o According to a UCCE Crop Budget, it would cost an estimated $3,635 per acre to establish a San Joaquin Valley almond orchard on land that had been previously planted to field and row crops.

o According to a UCCE Crop Budget, it would cost $8,539/acre to establish a San Diego County lemon grove.

o According to a UCCE Crop Budget, it would cost at least $832/acre to prepare uncultivated land to grow tomatoes in San Diego County.

Finally, remember that efforts to convert raw land to farmland, or poor quality, marginal farmland to good quality farmland usually require significant amounts of money, energy, and chemicals. The conversions could have significant direct and indirect negative environmental impacts. Production on the newly converted or improved farmland may not turn out to be sustainable over the long run. And there is no guarantee that the resulting farmland will support crops with yields as high as are found on the older, established farms in California.

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