U.C. COOPERATIVE EXTENSION

SAMPLE COSTS AND ENERGY REQUIRED TO PRODUCE

BARLEY

Using Non Tillage System and Summer Fallow Under Dryland Conditions

IN THE CENTRAL COAST - 1994

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BACKGROUND:

Land: Areas that produce dryland barley in the Central Coast are located inland from the coast, east of the Santa Lucia Mountain and the Sierra Madre Mountain ranges. This region lies within of most of the southern drainage of the Salinas River and the Carrizo Plains.

Climate: Rainfall is important factor affecting which crops can be successfully grown. Average annual rainfall for this region vary from 9.5 inches to 12 inches, almost all of which comes in the winter months. Historically temperature have ranged from 0° F to 117° with the extremes, again, occurring in the winter and summer. Growers plan their cropping system around these conditions in order to take advantage of the best possible growing conditions for dryland barley.

Rotation: Crop mix and rotation is very dependent on annual rainfall and how well it is stored in the soil profile. Low precipitation or weed infestations that used up stored water may cause growers to use a two year grain-fallow or a three year grain-fallow-fallow rotation. This can result in little or no income generated for one to two years. Rotation can have a beneficial effect on controlling weeds. Other commodities produced and uses for the same acreage in rotation with barley might include safflower, vetch, wheat, hay, and grazing for livestock.

Rental Agreement: Growers in the Central Coast both own and lease land for barley production Leases are charged as a per acre cash rent or a share rent on gross returns or yields. Cash rental for barley ground typically runs around $15 per acre. Share rents on the other hand can be a straight percentage of the gross returns or they can be on a sliding scale with the percentage dependent on the yield. Share rents might normally range between 10 to 25%. The land in this study is leased on a share rent basis at 15% of the gross return per acre.

GOVERNMENT PROGRAMS:

Federal farm programs can play an important roll in dryland barley production and require consideration by individual growers and landowners. A number of programs do exist that can provide support to growers farming on highly erodable land (HEL). These include the Conservation Reserve Program (CRP) and Agricultural Conservation Program (ACP). A complete discussion of each of the programs can not be accomplished in this study; it is only meant to briefly illustrate certain points pertinent to the barley enterprise described here. Growers should contact a local Agriculture Stabilization and Conservation Service (ASCS) and Soil Conservation Service (SCS) to determine how best to use these services.

Both ASCS and SCS are Federal agencies which provide expertise for managing various crop and conservation programs at the local level. All of the programs are administered by the ASCS, which handles applications and dispenses moneys. Technical and educational help for the conservation programs, such as measuring crop residue, is performed by the SCS. Management of program activities in counties are mandated to farmer-elected county committees. They provide the overall direction and guidance for planning and coordinating their district's programs. County committees are also responsible for choosing which cultural practices are allowable for growers to use in order to maintain program compliance. These practices are drawn from national list of acceptable conservation practices.

Conservation Compliance Plan: All land classified as HEL is required to have and maintain a Conservation Compliance Plan (CCP). A CCP is not a separate program, but a guide for the grower to meet individual conservation program requirements on their HEL. CCPs are designed by the grower and approved by the county committee. It is intended to discourage crop and livestock production on unprotected, HEL. Failure to institute a CCP on designated HEL results in a grower's ineligibility to

participate in farm support programs.

Agricultural Conservation Program: Growers wishing to produce crops on HEL can do so under the Agricultural Conservation Program (ACP). It is intended to provide cost sharing so that growers can use conservation measures that they might not perform without financial assistance. By providing financial support on a maximum of 75% of the program acreage for three to ten years, growers can transition to a production system that conserves soil and water. The program must be renewed each year. Livestock grazing is allowed under the ACP, but at least 70% plant residue must be left on the surface once the rainy season begins. Grazing lets growers utilize some of the barley stubble and reduce feed expenditures for livestock.

Conservation Reserve Program: The Conservation Reserve Program (CRP) does not allow the designated land be used for crop production. Its purpose is to place HEL in reserve and to convert it to trees (non-crop) or other permanent vegetation in order to enhance wildlife and environmental resources. This means that growers are actually reducing productive crop acreage, though it is more likely to be marginally, if at all, profitable. In return the grower receives a payment for the acreage put in reserve. By removing this land from production growers are reducing their total energy requirements and cash expenditures and still receiving a return from the land. CRPs require that the land have either trees, permanent cover, or both established and maintained for 10 years. Noxious weeds must be controlled and no grazing is allowed. Early withdrawal from the program will result in severe penalties.

However, federal farm programs can play an important roll in dryland barley production and require consideration by individual growers and landowners. A number of programs do exist that can provide support to growers farming on highly erodable land. These include the Conservation Reserve Program (CRP) and Agricultural Conservation Program (ACP). Growers should contact a local Agriculture Stabilization and Conservation Service (ASCS) and Soil Conservation Service (SCS) to determine how best to use these services.

Risk: Risk is caused by various sources of uncertainty which include production, price, and financial. Examples of these are drought, a decrease in price, and increase in interest rates. The risks associated with producing barley in the Central Coast under summer fallow, dryland conditions should not be minimized. While this study makes every effort to model a production system based on typical, real farm practices, it cannot fully represent financial, agronomic and market risks which affect the profitability and economic viability of barley production. Growers should consider all of the agronomic and economic risks before committing resources to barley production in the Central Coast.

ASSUMPTIONS:

FARM CHARACTERISTICS AND PRODUCTION PRACTICES:

The site for the farm in this study is characterized by moderate to highly erodable, uneven terrain of hilltops, hillsides, plateaus, and plains. Also characteristic of these farms is the large size. The growers interviewed had farms ranging from 3,600 to 64,000 acres, some of which is owned and some leased. Of the 7,100 acres of farm and range land 857 acres are in summer fallow, no-till system and 1,187 are cultivated under a conventional dryland barley system.

In both studies a seeding rate of 80 pounds of barley per acre is used. Both farming system splant with tractors and drills which are own by the farm.

For both no-till and conventionally tilled barley aqua ammonia is applied, but at different rates; at 200 pounds of material per acre for no-till and at 225 pounds of material for the conventionally tilled system.

This is equivalent to 40 and 45 pounds of actual nitrogen respectively. The aqua is injected into the ground at planting during the month of January and is the only fertilizer application made.

From November through December Roundup® is sprayed for control of weeds that have emerged after the first winter rains. The final herbicide application uses a combination of Glean® and 2,4-D for control of wild oats and various broadleaf's. This application is made in February through March. Roundup® is applied with the use of a ground sprayer and the combination of Glean® and 2,4-D is sprayed by aircraft.

Transportation rates used in this study are $2 per ton for hauling from the field to farm storage and $8 per ton for transporting from the farm to market.

YIELDS & RETURNS:

Yields: The yield for barley grown in the Central Coast that is used in this study is one ton per acre. Yield variations often occur due to the many environmental factors that can affect dryland farming. During the drought years barley produced only half of the one ton crop.

Returns: An estimated price of a $113.50 per ton of grain is used to calculate returns. The return price is an average based on the previous five years and is shown in **Table 2**. This study does not include any income from any of the government programs.

LABOR:

Hourly wages for workers is $5.75 per hour for both machine and non-machine workers. This is based on wages paid by the growers in this study. Adding 34% for Workers Compensation, Social Security, Medicare, insurance, and other possible benefits gives the labor rates shown of $7.71 per hour for both machine labor and non-machine labor.

Almost all of the growers supplied health insurance, housing and a truck in their benefits package. Some of the labor supplied to the farms is from family members, but they are still paid the same rate in this study. Labor for operations involving machinery are 20% higher than the operation time given in Table 1 to account for the extra labor involved in equipment set up, moving, maintenance, work breaks, and repair. Wages for management is not included as a cash cost. Any return above total costs is considered a return to management and risk.

CASH OVERHEAD:

Cash overhead consists of various cash expenses paid out during the year that are assigned to the whole farm and not to a particular operation. These costs include property taxes, interest on operating capital, office expense, liability and property insurance, and equipment repairs.

Interest on operating capital is based on cash operating costs and is calculated monthly until harvest at a nominal rate of 7.89% per year. A nominal interest rate is the going market cost of borrowed funds.

Counties charge a base property tax rate of 1% on the assessed value of the property. In some counties special assessment districts exist and charge additional taxes on property including equipment, buildings, and improvements. County taxes are calculated as 1% of the average value of the property for this study. Average value equals new cost plus salvage value divided by 2 on a per acre basis.

Insurance for farm investments vary depending on the assets covered and the amount of coverage. Property insurance provides coverage for property loss and is charged at 0.713% of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs $514 for the entire farm or $1.07 per acre.

Office and business expenses are estimated at $20 per acre. These expenses include office supplies, telephones, bookkeeping, accounting, legal fees, road maintenance, etc. Cash overhead costs are found in Tables 1, 2, 3, and 4.

NON-CASH OVERHEAD:

Non-cash overhead is comprised of depreciation and interest charged on equipment and other investments. Most of the equipment inventory on typical farms growing dryland barley in the Central Coast Region is purchased used. This study shows current purchase price for new equipment adjusted to 50% of new value to indicate a mix of new and used equipment. Annual equipment and investments costs are shown in Tables 1, 2, and 4. They represent depreciation and opportunity cost for each investment on an annual per acre basis.

Depreciation is a reduction in market value of investments due to wear, obsolescence, and age, and is on a straight line basis. Annual depreciation is calculated as purchase price minus salvage value divided by years the investment is held. The purchase price and years of life are shown in Table 4.

Interest is charged on investments to account for income foregone (opportunity cost) that could be received from an alternative investment. The investments are assumed to be owned outright. Therefore, interest on investments is a non-cash cost. Investments include land, alfalfa stand establishment, buildings, and equipment. Interest is calculated as the average value of the investment during its useful life, multiplied by 4.2% per year. Average value for equipment and buildings equals new cost plus salvage value divided by 2 on a per acre basis. The average value for land is equal to the purchase price because land does not depreciate. The interest rate used to calculate opportunity cost is estimated as a ten year average of the agricultural sectorwide longrun rate of return to production assets from current income. It is used to reflect the long-term realized rate of return to these specialized resources that can be used effectively only in the agricultural sector.

EQUIPMENT CASH COSTS:

Equipment costs are composed of three parts; non-cash overhead, cash overhead, and operating costs. Both of the overhead factors have been discussed in previous sections. The operating costs consist of fuel, lubrication, and repairs.

In allocating the equipment costs on a per acre basis, the following hourly charges are calculated first and shown in Table 8. Repair costs are based on purchase price, annual hours of use, total hours of life, and repair coefficients formulated by the American Society of Agricultural Engineers (ASAE). Fuel and lubrication costs are also determined by ASAE equations based on maximum PTO hp, and type of fuel used. The fuel and repair cost per acre for each operation in Tables 1 and 4 is determined by multiplying the total hourly operating cost in Table 8 for each piece of equipment used for the cultural practice by the number of hours per acre for that operation. Tractor time is 10% higher than implement time for a given operation to account for setup time. Prices for on-farm delivery of diesel and gasoline are $0.85 and $1.17 per gallon, respectively.

METHODOLOGY:

The detailed costs for both non tilled and conventional tilled dryland barley production in the Central Coast are presented in tables 1-7 and 9-16. Two hypothetical farm characterized by operations and resources considered typical for this region are simulated in this report inorder to calculate costs and returns and energy requirements. These hypothetical farms are based on interviews of selected barley growers using practices and techniques employed by them. These farms consists of 7,100 acres each, of

which 857 acres are in no-till barley production and 1,186 acres are in conventionally tilled, dryland barley production.

Energy Calculations: Cultivated crops convert solar energy into food, fiber, and energy which man can utilize. Farmers intensify crop yields by adding additional energy in the form of pesticides, fertilizers, water, mechanization, and labor. Energy applied by man for crop production can be categorized in two ways; that which is directly consumed by crop production, i.e. fuels, seed, fertilizer, etc., and energy which is sequestered in an input used in crop production such as that for materials and manufacturing of a tractor. By drawing an imaginary circle around the farm and counting all the units of energy that goes into the production for a particular crop, total energy consumed by that crop can be estimated.

Most crop inputs are usually expressed in terms of weights or measures when applied and must be converted into energy units. Inputs are converted to energy by multiplying the amount of the input by an energy coefficient. Coefficients for various materials are drawn from previously published sources which discuss how they are calculated. The basic unit of energy used in this study is a kilo calorie (kcal), though other units such as mega joule (MJ) and British thermal unit (Btu) are interchangeable.

Transforming equipment into kcal requires a list of equipment used by the farms and the weight of each. The equipment is listed in Table 4. The weight of the machinery is the basis for calculating the energy sequestered in it. Energy in machinery is found in the raw materials, manufacturing process, and repair parts and maintenance. These are referred to as embodied, fabrication, and repair parts energy respectively. Both the embodied and fabrication energy are determined by multiplying the machinery weight by the appropriate coefficient.

Repair parts and materials used for maintenance are estimated by using total accumulated repair (TAR), total embodied and fabrication energy, and 0.333. TAR represents the repair and service costs as a percentage of the original price of the equipment anytime during its life. The constant 0.333 is the amount of repair and maintenance parts exclusive of other maintenance costs. Repair parts energy is calculated by multiplying the equipment's appropriate TAR percentage by the full energy in embodied and fabrication energy and by 0.333.

The values energy values for total embodied and fabrication energy are adjusted to a percentage of total the life. This is the expected reliable life; once the machine becomes unreliable it is no longer used. The embodied and fabrication energy is adjusted to 82% of its total energy and added to the repair parts energy. The 82% represents the percentage useful over the life of the equipment.

Once the energy required for the equipment has been estimated, hourly energy allocations are determined. This is a matter of dividing the total embodied, fabrication, and repair parts energy over it's reliable life by the total hours of life. Since hours per equipment and operation can be computed, equipment energy per operation and crop be approximated

Energy for other crop materials is estimated by multiplying the amount of product used by a corresponding energy coefficient. These coefficients, like those for equipment, have been derived and explained in previous publications.

The summed total of all of the materials' fossil energy equivalents are referred to as total inputs. This divided by the total output which is the amount of energy sequestered in the crop yield. The resulting quotient is shown on Table 7 as the kcal output/kcal input and is commonly known as the input/output energy ratio (I/OR).

4. PRODUCTION CULTURAL PRACTICES:

Cultural practices for the production dryland barley in the Central Coast vary somewhat from grower to grower. However, due to the small number of cultural operations used to produce barley in a summer fallow cropping system, differences between grower practices are minor. These differences in cultural inputs can be caused by seasonal pest pressures, water availability and government regulations. The practices and inputs used in this cost study serve only as a typical guide based on actual grower practices.

Fertilization: Nitrogen is the primary nutrient needed by barley to insure adequate yields. While barley is responsive to nitrogen, timing the application with the proper fertilizer insures that the nitrogen will be available to the plant when needed. Aqua ammonia (20-0-0) is applied at a rate of 131.6 gallons of material per acre which is equivalent to 200 pounds of actual nitrogen per acre. The aqua is injected into the ground at planting during the month of January and is the only fertilizer application made.

Weed Control: Weed pressures vary each year, but those that cause problems for growers in this region continually consist of ripgut brome (*Bromus diandrus*), wild oats (*Avena fatua*), and Russian thistle (*Salsola iberica*). Control of weeds is extremely important under dryland conditions due to soil water lost to weeds. With less water available to barley, yields can be drastically reduced. In conventionally tilled barley, cultivation and herbicides are both used to manage weeds. But by using discs or cultivators for this purpose soil moisture is lost, thus requiring a one or two year fallow period in the rotation to store enough water in the soil for a barley crop. Since mechanical cultivation is not an available practice in a summer fallow system, a combination of chemicals and rotation are used to manage weeds in barley.

From November through December Roundup® is sprayed for control of weeds that have emerged after the first winter rains. The final herbicide application uses a combination of Glean® and 2,4-D for control of wild oats and various broadleaf's. This application is made in February through March. Roundup® is applied with the use of a ground sprayer and the combination of Glean® and 2,4-D is sprayed by aircraft.

Planting: With so few field operations dryland, summer fallow barley in the Central Coast, planting is a crucial operation that requires specialized equipment. With very large acreage of grains to plant in a limited amount of time, growers use large horsepower (Hp) tractors which pull a summer fallow drill. This type of drill is characterized by coulters that cut a slot in front of seed openers, tanks or hoppers that carry liquid or dry fertilizers, and are large and heavy. All of these factors allow the drill to perform several cultural tasks in one pass across the field, thus reducing energy needed and costs. When the coulters slice the soil before the seed openers, they till the soil slightly, performing the task of a disc or field cultivator. This reduces the energy needed to attain the proper planting depth by the seed openers. With fertilizer carriers attached to the drill, a separate operation of applying fertilizer is also eliminated. The size and weight are important for planting large acreage efficiently and so the coulters and openers can penetrate the untilled ground. Because of the weight and size and the fact that many of these fields are on slopes, tractors in the 200 to 360 Hp range are needed.

Farmers growing barley under dryland conditions seed in the range of 70 to 90 pounds per acre. In this study a seeding rate of 80 pounds of barley per acre is used.

RESULTS AND INTERVIEWS

PRODUCTION CULTURAL PRACTICES:

Cultural practices for the production of summer fallow, dryland barley in the Central Coast vary somewhat from grower to grower. However, due to the small number of cultural operations used to

produce barley in a summer fallow cropping system, differences between grower practices are minor. These differences in cultural inputs can be caused by seasonal pest pressures, water availability and government regulations. The practices and inputs used in this cost study serve only as a typical guide based on actual grower practices.

Fertilization: Nitrogen is the primary nutrient needed by barley to insure adequate yields. While barley is responsive to nitrogen, timing the application with the proper fertilizer insures that the nitrogen will be available to the plant when needed. Typically N use is slightly lower in the non tillage system than the conventionally tilled system (40 lbs of N versus 45 lbs of N), but yields equivalent.

Weed Control: Weed pressures vary each year, but those that cause problems for growers in this region continually consist of ripgut brome (*Bromus diandrus*), wild oats (*Avena fatua*), and Russian thistle (*Salsola iberica*). Control of weeds is extremely important under dryland conditions due to soil water lost to weeds. With less water available to barley, yields can be drastically reduced. In conventionally tilled barley, cultivation and herbicides are both used to manage weeds. But by using discs or cultivators for this purpose soil moisture is lost, thus requiring a one or two year fallow period in the rotation to store enough water in the soil for a barley crop. Since mechanical cultivation is not an available practice in a summer fallow system, a combination of chemicals and rotation are used to manage weeds in barley.

Planting: With so few field operations dryland, no-till barley in the Central Coast, planting is a crucial operation that requires specialized equipment. With very large acreage of grains to plant in a limited amount of time, growers use large horsepower (hp) tractors which pull a summer fallow drill. This type of drill is characterized by coulters that cut a slot in front of seed openers, tanks or hoppers that carry liquid or dry fertilizers, and are large and heavy. All of these factors allow the drill to perform several cultural tasks in one pass across the field, thus reducing energy needed and costs. When the coulters slice the soil before the seed openers, they till the soil slightly, performing the task of a disc or field cultivator. This reduces the energy needed to attain the proper planting depth by the seed openers. With fertilizer carriers attached to the drill, a separate operation of applying fertilizer is also eliminated. The size and weight are important for planting large acreage efficiently and so the coulters and openers can penetrate the untilled ground. Because of the weight and size and the fact that many of these fields are on slopes, tractors in the 200 to 360 Hp range are needed.

Farmers growing barley under dryland conditions seed in the range of 70 to 90 pounds per acre.

Residue Management: Increasing surface residue is the most important consequence of using a non tillage system. By using a no-till drill to accomplish all of the cultivation and planting operations, standing stubble is left which improves water infiltration, increases organic matter in soils, and reduces soil lost through erosion. These physical factors can lead to reductions in energy and costs required to grow a barley crop under these conditions.

Growing barley in a conventional tillage system increases the amount of residue incorporated into the soil, thus leaving it vunerable to erosion and lowers rainfall infiltration. More machinery is also required to accomplish cultivations

Residue Management: Increasing surface residue is the most important consequence of using a summer fallow system. By using a summer fallow drill to accomplish all of the cultivation and planting operations, standing stubble is left which improves water infiltration, increases organic matter in soils, and reduces soil lost through erosion. These physical factors lead to reductions in energy and costs required to grow a barley crop under these conditions.

The pesticides, rates, and cultural practices mentioned in this cost study are a few of those that are listed in the UC IPM Small Grains Pest Management Guidelines and Integrated Pest Management For Small Grains. Written recommendations are required for many pesticides and are made by licensed pest control advisors. For information and pesticide use permits, contact the local county Agricultural Commissioner's office. Contact your local farm advisor for advice on production practices.

Harvest: Growers in the Central Coast own their harvest equipment. This compliment of equipment consists of combines, truck-tractors, and several grain trailers. The combines are specifically designed for hillside use. This design lets the grain platform (or header) and chassis run at the same slope as the hill while the cab and grain bin remain upright. To harvest the grain in a timely manner, 20 foot headers are used. Truck-tractors are employed to haul empty grain trailers along side the combines so harvested grain can be loaded into them. Full trailers are hauled from the fields to either on farm storage facilities or to market were it is sold.

Transportation: Growers own trucks and trailers and usually haul their grain to market themselves. The other option is to have the barley hauled by a contract hauling company. In either situation growers bear the cost of transportation. Two transportation rates are normally charged. This reflects grain hauled from the field or from grower storage. Typical hauling charges might be $8 per ton hauled from on-farm storage and $10 per ton to haul grain from the field.

Equipment for harvest operations are inventoried in investment costs on Table 4, and labor, fuel, repairs, depreciation, and operating interest, are calculated as harvest costs in Table 1.

Grower Comments: All of the growers interviewed expressed many similar views on the benefits and deficiencies of a summer fallow barley production. One of the most emphasized points made by all of the growers was that this type of cropping system increased the amount of water that infiltrates the surface and is held in the soil profile. This has allowed most of them to grow crops on an annual basis. The advantage to not having to leave fields fallow for one to two years following a crop is that a return is realized annually. While yields are usually lower in a annual rotation system the fact of having income every year as opposed to every second or third year allows the growers to economically sustain their farms. They also felt that during the drought what rain they did receive was capture and held in the soil which allowed them to grow barley, even though they yielded less barley. Conventionally tilled fields, they said, lost rain through runoffs allowing very little moisture retention and causing the fields to remain fallow longer.

Erosion control is another benefit of summer fallow barley and is the primary reason for many government programs available to the growers. Almost all of the land farmed in this region is classified as highly erodable by the SCS. Yet all of the farmers in this study said they had either none or very little erosion problems. One grower stated that while he had very minor erosion troubles, neighbors on identical land had " ditches in his fields that are big enough to lose a harvester in".

Those growers that have the right conditions to utilize an annual cropping system have found better success in controlling weeds when they are able to rotate fields to a different crop each year rather than leave them fallow and control them with herbicides exclusively. Although rotation manages many weeds, herbicides important for control. Growers expressed that substituting herbicides for discing or cultivation increased speed over the fields and reduced machinery and labor costs. The biggest problem that growers saw with the switch from mechanical to chemical control was the relatively few materials that will control certain weeds. No available herbicides can provide control for Russian thistle which is a problem.

All of the growers participate in several government farm programs. These include acreage set asides,

ACP, CRP and private land hunting programs. Which programs were used depend on the situation of each of the growers. See the Government Programs section for a better description or contact your local ASCS or SCS office.

Grazing was also mentioned by most of the growers as an enterprise that many of them operate and it has benefited by the switch from conventional tillage to a summer fallow system. Significantly higher amounts of stubble in the fields and less acres left fallow increase the number of cattle the land can carry. In the lower rainfall areas in this region, lower amounts of stubble are attained and grazing it with cattle can put the land into non-compliance with the conservation program they are under by leaving less than the allowable surface residue needed for proper erosion control. The one grower who does not raise cattle said that the increased stubble has improved the forage for wildlife which helps their private hunting program.

As many advantages provided by a summer fallow cropping system, growers voiced certain disadvantages. Machinery has made summer fallow systems possible, specifically the summer fallow drill. Yet much of this type of equipment is very expensive, requiring large capital investments. Since summer fallow drills are designed to make an opening in untilled soil, a great amount of weight is required to force the coulters into the ground. Seeding with a fully loaded summer fallow drill on hillsides slows the time in which an acre can be planted and increases the size of tractor needed to pull it. When a limited planting window is available, slower planting time can increase a growers risk for failing to drill all of the acreage.

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U.C. COOPERATIVE EXTENSION

Table 1. COSTS PER ACRE TO PRODUCE DRYLAND BARLEY
SUMMER FALLOW
CENTRAL COAST - 1993

Labor Rate: $7.71/hr. machine labor Interest Rate: 4.00%
Yield per Acre: 1.00 Ton

Operation	Operation Time (Hrs/A)	Cash and Labor Costs per Acre: Labor Cost	Fuel,Lube & Repairs	Material Cost	Custom/ Rent	Total Cost	Your Cost
Cultural:							
Chisel Plow Field	0.10	0.93	2.83	0.00	0.00	3.75	
Disc Field	0.14	1.32	3.92	0.00	0.00	5.24	
Cultivate Fields	0.10	0.93	2.30	0.00	0.00	3.22	
Plant	0.10	0.95	3.73	22.75	0.00	27.43	
Apply Herbicide	0.00	0.00	0.00	0.30	6.75	7.05	
Pickup Truck Use	0.08	0.74	0.43	0.00	0.00	1.17	
TOTAL CULTURAL COSTS	0.53	4.87	13.20	23.05	6.75	47.86	
Harvest:							
Harvest	0.19	1.74	6.32	0.00	0.00	8.05	
Haul From Field To Storage	0.00	0.00	0.00	0.00	2.00	2.00	
Haul to Market	0.00	0.00	0.00	0.00	8.00	8.00	
TOTAL HARVEST COSTS	0.19	1.74	6.32	0.00	10.00	18.05	
Interest on operating capital @ 4.00%						1.73	
TOTAL OPERATING COSTS/ACRE		6.61	19.52	23.05	16.75	67.65	
TOTAL OPERATING COSTS/TON						67.65	
CASH OVERHEAD:							
Office Expense						5.00	
Share Rent @ 15%						17.02	
Property Taxes						0.80	
Property Insurance						0.40	
Investment Repairs						0.05	
TOTAL CASH OVERHEAD COSTS						23.27	
TOTAL CASH COSTS/ACRE						90.92	
TOTAL CASH COSTS/TON						90.92	
NON-CASH OVERHEAD:							

Investment	Per producing Acre	Annual Cost: Depreciation	Interest @ 9.00%		
Shop Buildings	10.29	0.51	0.46	0.98	
Shop Tools	1.55	0.14	0.08	0.22	
Grain Storage	7.44	0.37	0.33	0.71	
Fertilizer Tanks	3.90	0.18	0.19	0.37	
Fuel Tanks	7.97	0.40	0.36	0.76	
Equipment	116.88	10.12	5.79	15.91	
TOTAL NON-CASH OVERHEAD COSTS	148.03	11.72	7.21	18.93	
TOTAL COSTS/ACRE				109.85	
TOTAL COSTS/TON				109.85	

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Table 2. COSTS AND RETURNS PER ACRE TO PRODUCE DRYLAND BARLEY
SUMMER FALLOW
CENTRAL COAST – 1993

Labor Rate: $7.71/hr. machine labor Interest Rate: 4.00%

	Quantity/Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Barley	1.00	Ton	113.50	113.50	
TOTAL GROSS RETURNS FOR BARLEY				113.50	
OPERATING COSTS					
Seed:					
Barley Seed	80.00	lb	0.20	16.00	
Fertilizer:					
Aqua Ammonia	225.00	lb	0.03	6.75	
Custom:					
Air Application - Herb.	1.00	appl	6.75	6.75	
Haul Grain	2.00	Ton	2.00	10.00	
Herbicide:					
Glean DF	0.17	Oz	1.74	0.30	
Labor (machine)	0.86	hrs	7.71	6.61	
Labor (non-machine)	0.00	hrs	0.00	0.00	
Fuel - Gas	0.20	gal	1.05	0.21	
Fuel - Diesel	11.82	gal	0.74	8.75	
Lube				1.34	
Machinery repair				9.21	
Interest on operating capital @ 4.00%				1.73	
TOTAL OPERATING COSTS/ACRE				67.65	
TOTAL OPERATING COSTS/TON				67.65	
NET RETURNS ABOVE OPERATING COSTS				45.85	
CASH OVERHEAD COSTS:					
Office Expense				5.00	
Share Rent @ 15%				17.02	
Property Taxes				0.80	
Property Insurance				0.40	
Investment Repairs				0.05	
TOTAL CASH OVERHEAD COSTS/ACRE				23.27	
TOTAL CASH COSTS/ACRE				90.92	
TOTAL CASH COSTS/TON				90.92	
NON-CASH OVERHEAD COSTS (DEPRECIATION & INTEREST):					
Shop Buildings				0.98	
Shop Tools				0.22	
Grain Storage				0.71	
Fertilizer Tanks				0.37	
Fuel Tanks				0.76	
Equipment				15.91	
TOTAL NON-CASH OVERHEAD COSTS/ACRE				18.93	
TOTAL COSTS/ACRE				109.85	
TOTAL COSTS/TON				109.85	
NET RETURNS ABOVE TOTAL COSTS				3.65	

Table 3.

U.C. COOPERATIVE EXTENSION
MONTHLY CASH COSTS PER ACRE TO PRODUCE DRYLAND BARLEY
SUMMER FALLOW
CENTRAL COAST - 1993

Beginning FEB 92 / Ending JUL 93	FEB 92	MAR 92	APR 92	MAY 92	JUN 92	JUL 92	AUG 92	SEP 92	OCT 92	NOV 92	DEC 92	JAN 93	FEB 93	MAR 93	APR 93	MAY 93	JUN 93	JUL 93	TOTAL
Cultural:																			
Chisel Plow Field	3.75																		3.75
Disc Field		5.24																	5.24
Cultivate Fields			3.22																3.22
Plant										27.43									27.43
Apply Herbicide														7.05					7.05
Pickup Truck Use	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	1.17
TOTAL CULTURAL COSTS	3.82	5.31	3.29	0.07	0.07	0.07	0.07	0.07	0.07	27.50	0.07	0.07	0.07	7.11	0.07	0.07	0.07	0.07	47.86
Harvest:																			
Harvest																		8.05	8.05
Haul From Field To Storage																		2.00	2.00
Haul to Market																		8.00	8.00
TOTAL HARVEST COSTS																		18.05	18.05
Interest on oper. capital	0.01	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.13	0.13	0.13	0.13	0.16	0.16	0.16	0.16	0.22	1.73
TOTAL OPERATING COSTS/ACRE	3.83	5.34	3.33	0.11	0.11	0.11	0.11	0.11	0.11	27.63	0.20	0.20	0.20	7.27	0.22	0.22	0.22	18.34	67.65
TOTAL OPERATING COSTS/TON	3.83	5.34	3.33	0.11	0.11	0.11	0.11	0.11	0.11	27.63	0.20	0.20	0.20	7.27	0.22	0.22	0.22	18.34	67.65
OVERHEAD:																			
Office Expense	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	5.00
Share Rent @ 15%																		17.02	17.02
Property Taxes						0.40						0.40							0.80
Property Insurance						0.20						0.20							0.40
Investment Repairs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.05
TOTAL CASH OVERHEAD COSTS	0.28	0.28	0.28	0.28	0.28	0.88	0.28	0.28	0.28	0.28	0.28	0.88	0.28	0.28	0.28	0.28	0.28	17.30	23.27
TOTAL CASH COSTS/ACRE	4.11	5.62	3.61	0.39	0.39	0.99	0.39	0.39	0.39	27.91	0.48	1.08	0.48	7.55	0.50	0.50	0.50	35.64	90.92
TOTAL CASH COSTS/TON	4.11	5.62	3.61	0.39	0.39	0.99	0.39	0.39	0.39	27.91	0.48	1.08	0.48	7.55	0.50	0.50	0.50	35.64	90.92

U.C. COOPERATIVE EXTENSION

Table 4. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS
CENTRAL COAST - 1993

ANNUAL EQUIPMENT COSTS

Yr	Description	Price	Yrs Life	- Non-Cash Over. - Depre-ciation	Interest	- Cash Overhead - Insur-ance	Taxes	Total
93	280 HP 4WD Tractor	137245	12	10293.30	6793.65	377.42	754.85	18219.22
93	360 HP 4WD Tractor	149028	12	11177.00	7376.90	409.83	819.66	19783.39
93	Chisel Plow 40'	16904	15	1014.27	836.73	46.49	92.97	1990.46
93	Combine - 20' Header	156238	10	14061.40	7733.79	429.65	859.31	23084.15
93	Combine - 20' Header	156238	10	14061.40	7733.79	429.65	859.31	23084.15
93	Cultivator - Field	14137	15	848.20	699.79	38.88	77.75	1664.62
93	Disc - Offset 30'	37523	15	2251.40	1857.37	103.19	206.38	4418.34
93	Drill - 30'	33415	6	5012.17	1654.06	91.89	183.78	6941.90
93	Pickup Truck - 1/2 Ton	17240	4	3879.00	853.38	47.41	94.82	4874.61
93	Pickup Truck - 3/4 Ton	21759	4	4895.75	1077.08	59.84	119.68	6152.35
TOTAL		739727		67493.89	36616.54	2034.25	4068.51	110213.19
40% of New Cost *		295891		26997.56	14646.62	813.70	1627.40	44085.28

* Used to reflect a mix of new and used equipment.

ANNUAL INVESTMENT COSTS

Yr	Description	Price	Yrs Life	- Non-Cash Over. - Depre-ciation	Interest	- Cash Overhead - Insur-ance	Taxes	Repairs	Total
INVESTMENT									
	Fertilizer Tanks	27682	20	1245.70	1370.25	76.12	152.25	15.00	2859.32
	Fuel Tanks	56620	20	2831.00	2547.90	141.55	283.10	50.00	5853.55
	Grain Storage	52800	20	2640.00	2376.00	132.00	264.00	100.00	5512.00
	Shop Buildings	73032	20	3651.60	3286.44	182.58	365.16	75.00	7560.78
	Shop Tools	11000	10	990.00	544.50	30.25	60.50	100.00	1725.25
TOTAL INVESTMENT		221134		11358.30	10125.09	562.50	1125.01	340.00	23510.90

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Office Expense	7100.00	Acre	5.00	35500.00
Share Rent @ 15%	1186.00	Acre	17.02	20185.72

U.C. COOPERATIVE EXTENSION

Table 5. HOURLY EQUIPMENT COSTS
CENTRAL COAST - 1993

Yr	Description	Actual Hours Used	COSTS PER HOUR -Non-Cash Over.- Depre-ciation	Interest	- Cash Overhead - Insur-ance	Taxes	Repairs	-------- Operating -------- Fuel & Lube	Total Oper.	Total Costs/Hr.
93	280 HP 4WD Tractor	999.8	4.12	2.72	0.15	0.30	4.58	13.83	18.41	25.69
93	360 HP 4WD Tractor	999.8	4.47	2.95	0.16	0.33	4.97	17.78	22.75	30.66
93	Chisel Plow 40'	165.6	2.45	2.02	0.11	0.22	3.24	0.00	3.24	8.04
93	Combine - 20' Header	199.6	28.18	15.50	0.86	1.72	18.93	11.61	30.54	76.79
93	Combine - 20' Header	199.6	28.18	15.50	0.86	1.72	18.93	11.61	30.54	76.79
93	Cultivator - Field	165.6	2.05	1.69	0.09	0.19	2.71	0.00	2.71	6.73
93	Disc - Offset 30'	169.4	5.32	4.39	0.24	0.49	7.18	0.00	7.18	17.62
93	Drill - 30'	199.2	10.07	3.32	0.18	0.37	11.18	0.00	11.18	25.12
93	Pickup Truck - 1/2 Ton	463.6	3.35	0.74	0.04	0.08	2.09	3.02	5.11	9.31
93	Pickup Truck - 3/4 Ton	463.6	4.22	0.93	0.05	0.10	2.64	3.02	5.66	10.96

Table 6.

U.C. COOPERATIVE EXTENSION
RANGING ANALYSIS
CENTRAL COAST – 1993

COSTS PER ACRE AT VARYING YIELDS TO PRODUCE DRYLAND BARLEY - SUMMER FALLOW

	YIELD (TON/ACRE)						
	0.70	0.80	0.90	1.00	1.10	1.20	1.30
OPERATING COSTS/ACRE:							
Cultural Cost	48	48	48	48	48	48	48
Harvest Cost	13	14	16	18	20	22	23
Interest on operating capital	2	2	2	2	2	2	2
TOTAL OPERATING COSTS/ACRE	62	64	66	68	69	71	73
TOTAL OPERATING COSTS/TON	88.88	80.03	73.15	67.65	63.15	59.39	56.22
CASH OVERHEAD COSTS/ACRE	23	23	23	23	23	23	23
TOTAL CASH COSTS/ACRE	85	87	89	91	93	95	96
TOTAL CASH COSTS/TON	122.01	109.06	98.98	90.92	84.32	78.82	74.16
NON-CASH OVERHEAD COSTS/ACRE	18	18	19	19	19	20	20
TOTAL COSTS/ACRE	103	105	108	110	112	114	116
TOTAL COSTS/TON	147.21	131.72	119.60	109.85	101.83	95.12	89.42

NET RETURNS PER ACRE ABOVE OPERATING COSTS FOR DRYLAND BARLEY - SUMMER FALLOW

PRICE	YIELD (TON/ACRE)						
(DOLLARS PER TON)	0.70	0.80	0.90	1.00	1.10	1.20	1.30
100.00	8	16	24	32	41	49	57
105.00	11	20	29	37	46	55	63
110.00	15	24	33	42	52	61	70
113.50	17	27	36	46	55	65	74
120.00	22	32	42	52	63	73	83
125.00	25	36	47	57	68	79	89
130.00	29	40	51	62	74	85	96

NET RETURNS PER ACRE ABOVE CASH COSTS FOR DRYLAND BARLEY - SUMMER FALLOW

PRICE	YIELD (TON/ACRE)						
(DOLLARS PER TON)	0.70	0.80	0.90	1.00	1.10	1.20	1.30
100.00	-15	-7	1	9	17	25	34
105.00	-12	-3	5	14	23	31	40
110.00	-8	1	10	19	28	37	47
113.50	-6	4	13	23	32	42	51
120.00	-1	9	19	29	39	49	60
125.00	2	13	23	34	45	55	66
130.00	6	17	28	39	50	61	73

NET RETURNS PER ACRE ABOVE TOTAL COSTS FOR DRYLAND BARLEY - SUMMER FALLOW

PRICE	YIELD (TON/ACRE)						
(DOLLARS PER TON)	0.70	0.80	0.90	1.00	1.10	1.20	1.30
100.00	-33	-25	-18	-10	-2	6	14
105.00	-30	-21	-13	-5	3	12	20
110.00	-26	-17	-9	0	9	18	27
113.50	-24	-15	-5	4	13	22	31
120.00	-19	-9	0	10	20	30	40
125.00	-16	-5	5	15	25	36	46
130.00	-12	-1	9	20	31	42	53

U.C. COOPERATIVE EXTENSION

Farming System: Summer Fallow
Crop: Barley - Dryland
Year: 1993

Operating Input	Quantity/Acre	Unit	kcal/Acre
Seed			
Barley	80	Lb	265,440
Fertilizer			
Aqua Ammonia	45	Lb of N	2,659
Herbicide			
Glean DF	0.0013	Gal	68
Custom/Contract/Rental			
Air Application	1	Ac	7,355
Haul	2000	Lb	201,600
Gasoline			
Gasoline	0.2	Gal	6,192
Diesel			
Diesel	11.82	Gal	424,976
Machinery			
Total Equipment			24,385
Investments			
Buildings			3,011
Grain Storage			150
Fuel Tanks			2,450
Shop Tools			392
Fertilizer Tanks			4
Labor			
	0.86	Hours	
TOTAL INPUT		kcal	938,682
OUTPUT			
Barley Yield	2000	Lb	3,161,818
EFFICIENCY			
kcal output/kcal input ratio			3.37
kcal output/labor hour ratio			3,676,532.77