U.C. COOPERATIVE EXTENSION

SAMPLE COSTS AND ENERGY REQUIRED TO PRODUCE

WHEAT

Under Dryland And Non Tillage Conditions

IN YOLO COUNTY - 1994

by

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The detailed costs for wheat production in the Yolo County are presented in this study. The hypothetical farm used in this report is based on a survey of selected grower practicing these techniques and consists of 1715 acres of which 130 acres are in no-till wheat production.

Practices described in this study are based on those production procedures used by the growers surveyed in this study and represent practices used under growing conditions on the Yolo County. Sample costs given for labor, materials, equipment and contract services are based on growers' costs and current figures. Some costs and practices detailed in this study may not be applicable to your situation. This study is only intended as a guide and can be used in making production decisions, determining potential returns, preparing budgets and evaluating production loans. A blank *Your Cost* column is provided to enter your actual costs on **Tables 2** and **3**, **Costs Per Acre to Produce Wheat** and **Costs And Returns Per Acre to Produce Wheat**, respectively.

This study consists of General Assumptions for Producing Wheat and eight tables and two charts.

A companion study entitled, " Sample Costs and Energy Required to Produce Wheat Under Dryland and Conventional Tillage Conditions in the Yolo County - 1994" is available for those interested in conventionally tilled wheat production or a comparison between the two systems.

For an explanation of calculations used for the study refer to the attached General Assumptions or call the Department of Agricultural Economics, Cooperative Extension, University of California, Davis, California, (530) 752-3589 or the farm advisor in the county of interest.

University of California and the United States Department of Agriculture cooperating.

GENERAL ASSUMPTIONS FOR PRODUCING NO-TILL, DRYLAND WHEAT
Yolo County- 1994
U.C. Cooperative Extension

The following is a description of some general assumptions pertaining to sample costs of producing dryland wheat using non-tillage practices in Yolo County. Practices described should not be considered recommendations by the University of California, but rather represent production procedures considered typical for this crop and area. Some of these costs and practices may not be applicable to your situation nor used during every production year. Additional ones not indicated may be needed. Cultural practices for the production of wheat vary by grower and region. Variations can be significant. The practices and inputs used in this cost study serve only as a sample or guide. These costs are represented on an annual, per acre basis. *The use of trade names in this report does not constitute an endorsement or recommendation by the University of California nor is any criticism implied by omission of other similar products.*

1. LAND, CLIMATE, AND ROTATION:

Land: Areas that produce dryland wheat in Yolo County are located along the eastern foothills of the southern Sacramento Valley. This region contains the Dunnigan Hills and the foothill portions of the Capay Valley.

The site for the farm in this study is characterized by terrain of rolling hillsides and hilltops. The soil types predominate in dryland grain fields are Corning and Seahorn, though other soils may also be found. Also characteristic of these farms is the large size. The growers interviewed had farms ranging from 900 to over 8,000 acres, some of which is owned and some leased. The farm for this study consists of 1,715 acres of land of which 130 acres are in actual no-till, dryland wheat production

Climate: Along with soil and topography, rainfall is another important factor affecting which crops can be successfully grown. Typical annual rainfall for this region vary from 14 inches to 20 inches, almost all of which comes in the winter months. Historically temperature have ranged from 9_ F to 119_ with the extremes, again, occurring in the winter and summer. Average winter temperature is 45° and the summer months average 81°. Growers plan their cropping system around these conditions in order to take advantage of the best possible growing conditions for dryland wheat.

Rotation: Depending on the number of fallow years in a rotation and how the fallow is utilized, i.e. grazing, little or no income may be generated for one or more years. Rotation can have a beneficial effect on controlling weeds and other pests. Weeds that are not controlled by herbicides are usually managed by rotating into other crops, fallowing the land, and/or cultivation. Other commodities produced and uses for the same acreage in rotation with wheat might include lentils, safflower, vetch, peas, hay, and grazing for livestock.

Growers in this region use several different rotation patterns depending on their individual situation. Annual rainfall, when it occurs, and weed pressures are probably the most important agronomic factors influencing crop rotation. Dryland wheat is very dependent on the amount of rain and how well it is stored in the soil profile. Low precipitation or weed infestations that use up stored water may cause growers to use a rotation pattern different from the two year rotation (annual cropping) pattern described in this report; grain - legume (or other crop) - grain rotation. Grazing livestock, if it occurs, would take place during the summer months only. Examples of different rotations for dryland wheat found in the Yolo County region may include, but are not limited to are shown in Table A.

Table A. DRYLAND WHEAT ROTATION PATTERNS FOR YOLO COUNTY

ROTATION	YEAR 1	YEAR 2	YEAR 3	YEAR 4
Annual	Wheat	Legume	Wheat	Legume
2-Year (Summer Fallow)	Wheat	Summer Fallow	Wheat	Summer Fallow
3-Year (Summer Fallow)	Wheat	Pasture (Graze)	Summer Fallow	Wheat

The annual rotation shown in Table A is being used successfully by some growers under a non tillage system. The limiting factor with this system are weeds that cannot be controlled within the second year. The 2-year rotation is similar to the annual system in that it is only out of wheat for one year. However, the field is fallowed in the second year using herbicides to manage weeds. This does not allow any cash crop to be grown which reduces the average annual return to the system. This system does allow more flexibility in controlling weeds that are a problem in the wheat year. The 3-year rotation includes a pasture of resident vegetation utilized for grazing livestock following wheat. After the pasture year a summer fallow period begins where weeds are controlled with chemicals before wheat is planted again in the fall. Advantages to this system is that a longer period of time allows for better control of weeds and additional revenues are realized by utilizing stubble and pasture for livestock feed. The main disadvantage is that the fallow year does provide any income over the rotation period.

2. RENTAL AGREEMENT:

Growers along the western foothills of Yolo County characteristically both own and lease land for dryland wheat production. Leases are charged as a per acre cash rent or a share rent on gross returns or yields. Cash rental for wheat ground typically runs around $20 to 25 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 20 to 30%. The land in this study is leased on a share rent basis at 20% of the gross return per acre.

3. GOVERNMENT PROGRAMS:

Several Federal conservation and crop support programs are used by growers of producing dryland wheat on highly erodable land (HEL). A complete discussion of each of the programs can not be accomplished in this study; it is only meant to briefly describe certain points pertinent to the wheat enterprise described here. Contact your local Agricultural Stabilization and Conservation Service (ASCS) and the Soil Conservation Service (SCS) for further information.

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 growers 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 wheat 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. It's 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 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 form 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.

Income from government conservation or crop support programs are not included in this study. Actual receipts from these programs may vary, but growers should take into consideration additional returns in order to properly determine what their potential return might be.

4. PRODUCTION CULTURAL PRACTICES:

Cultural practices for the production of no-till, dryland wheat in Yolo County vary somewhat from grower to grower. However, due to the small number of cultural operations used to produce wheat in a non tillage cropping system, differences between grower practices are minor. These differences in cultural inputs can be influenced by seasonal pest pressures, soil water availability, and government regulations. The practices and inputs used in this cost study serve only as a guide based on actual grower practices. Operations used in this study are shown in Tables 1 and 3. Tables 1-7 show costs, returns, and energy required for dryland wheat in an annual cropping system while Table 8 shows a two year rotation with a summer fallow.

Fertilization: Nitrogen is the primary nutrient needed by wheat to insure adequate yields. While wheat 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) and 16-20-0 are applied at a rate of 32.9 gallons and 150 pounds of material per acre, respectively. This is equivalent to 74 pounds of actual nitrogen and 30 pounds of P_2O_5 per acre. The fertilizers are banded into the ground at planting during the month of November.

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 zorro fescue. Control of weeds is extremely important under dryland conditions due to soil water lost to weeds and competition with wheat which can drastically reduce yields. In conventionally tilled wheat, cultivation and herbicides are both used to manage weeds. But by using discs or cultivators for this purpose soil moisture may be lost and possibly requiring an extra year fallow period in the rotation to store enough water in the soil for a wheat crop. Since mechanical cultivation is not an available practice in a non tillage system, a combination of chemicals and rotation are used to manage weeds in wheat.

Only one application of herbicides is made during the year in this no-till system; this occurs in January following planting. A mix of Buctril– and Hoelon– is sprayed for control of weeds that have emerged after planting. This combination of herbicides is applied with the use of a ground sprayer.

Planting: With so few field operations dryland, non tillage wheat in the Yolo County, 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 no-till 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 160 to 205 Hp range are used.

Farmers growing wheat under dryland conditions seed in the range of 90 to 110 pounds per acre. In this study a seeding rate of 100 pounds of wheat per acre is used.

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 lead to reductions in energy and costs required to grow a wheat 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.

5. ENERGY AND LABOR REQUIREMENTS:

Energy Methodology: 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 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 the energy 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 that it, total energy consumed by that crop can be estimated.

Most crop inputs are usually expressed in terms of weights or measures 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

Buildings and other storage facilities are calculated on the square footage of the structure multiplied by an energy coefficient derived for them. Other investment are calculated similarly.

Energy for other crop materials such as pesticides, fuel, seed, etc., are 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 input energy (TIE) in Table 7. 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 output/input energy ratio (O/IR).

Labor Methodology: Accounting for labor in energy analysis has been the subject of much discussion. The focus has been on whether to assess labor as energy towards crop production or treat it as a separate input measured in time rather than energy units. This study approaches labor as the latter, in terms of hours per crop.

Labor is calculated for each operation based on time involved. Both labor time and cost for operations involving machinery are 20% higher than the operation time given in Table 1. This is to account for the extra labor involved in equipment set up, moving, maintenance, work breaks, and repair. If machine and non-machine labor are used, the two are summed into one labor figure. In Table 7, the total labor is divided by the total crop output in terms of kcal. This quotient is termed kcal output/labor hour ratio (LR).

Results: There are three important measures found in the results of Table 7; O/IR, TIE, and LR.

The O/IR for conventionally tilled wheat on a three year rotation is 2.96 as compared to 2.34 for the no-till annual system. The higher the number denotes a more energy efficient system related to crop output. While this indicates that the conventionally tilled, three year system is more energy efficient in terms of the amount of energy produced in the crop by the that which is used, looking at the TIE shows that the non tillage system used less energy (1,205,960 kcal) in total than the cultivated system (1,571,308 kcal).

The reason for the discrepancy is the yield difference. The conventionally tilled wheat out-yields the non-tilled 2,490 to 1,891 pounds per acre. Variations in yields between the two systems can result in large changes in the O/IR.

Labor efficiencies for the two systems is reverse of the O/IR; the no-till wheat is more labor efficient. Again, the larger the number, the better the efficiency. The non tillage crop had a LR of 3,529,509 kcal per hour versus 2,886,877 for the conventional wheat. Since there are less operations involved with no-till wheat, less hours are accumulated.

Conclusions: Because of the rotation differences it is hard to draw a decisive conclusion that one system is a more efficient user of energy than the other. If the wheat yield for the non tillage system were to reach the same level as the conventional tillage system then the ranking by O/IR would be reversed due to the lower overall use of energy in the no-till crop. Looking at the rotation period for both systems, the three year, conventionally tilled crop's total energy use for the wheat only is 523,769 kcal annually, while the two year non tillage system expends 602,980 kcal on an annual basis. However, neither system takes into account any of the other enterprises raised during the rotation, either for energy or cost concerns, which would have dramatic changes for energy use. As an example, during the second year of the no-till wheat another crop is grown which uses added energy, but also provides additional output. At the same time, livestock are grazed on the conventional wheat stubble converting more of the crop into useful energy. Thus, depending on the cropping pattern and the crops grown efficiencies can be changed based on the whole rotation instead of a single enterprise.

6. GROWER COMMENTS:

Growers interviewed expressed many different views on the benefits and deficiencies of a non tillage wheat production. One of the most emphasized points made by some 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 a few of them to grow crops on an annual basis. The advantage to not leaving fields fallow for one to two years following a crop is that a return is realized annually. While yields are sometimes lower in an 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. In fact, farmers utilizing no-till system felt that the drought had no adverse affect on their yield. Growers that have moved to an annual rotation, alternating wheat with legumes or safflower, feel that the key to non tillage in dryland wheat is the rotation. These growers are still experimenting with different rotations that will fit their requirements for weed control and profitability.

Erosion control is another benefit of no-till wheat and is the primary reason for many government programs available to the growers. Some of the land farmed dryland 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 on this land. One grower said that most of their HEL ground was put into the CRP, so consequently has very little HEL in production.

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 are necessary 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 adequate control for zorro fescue which is a problem.

All of the growers participate in several government farm programs. These include acreage set asides, ACP, and CRP. 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. With as many advantages provided by a non tillage cropping system, growers still voiced certain disadvantages. Machinery has made non tillage systems possible, specifically the no-till drill. Yet much of this type of equipment is very expensive, requiring large capital investments. Certain growers also noted that the expense of no-till drills deters them from purchasing one especially with the no-till wheat system unproved to them. An option would be to rent or lease a no-till drill, but there are none available for rental if they wished to seed under a non-tillage system. Since no-till 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 no-till 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 plant all of their acreage. However, it was the opinion of some that the no-till system has increased the organic matter content of their soils to the point where it is easier to work and will, thereby, lower fuel consumption by reducing time in the field.

7. HARVEST AND TRANSPORTATION:

Harvest: Growers in the Yolo County own their harvest equipment. This compliment of equipment consists of combines, bankout wagons, truck-tractors, and several grain trailers. The combines are specifically designed for hillside use, though in some instances they may not be needed. 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, a 24 foot header are used. Bankout wagons are employed to haul grain from the combines to empty trailers along the roadside. Full trailers are hauled from the fields to either on farm storage facilities or to market were it is sold.

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. If a grower contracts his harvest operation all harvesting equipment should be removed from investment costs in Table 4, its appropriate cost should be subtracted from harvest costs in Table 1 and a custom charge would then be added.

Transportation: While many growers own trucks and trailers, they usually have the grain hauled to storage by commercial carriers or the cooperative's trucks. The other option is to transport the wheat with their own equipment. In either situation growers bear the cost of transportation. Typical hauling charges might be $8 per ton hauled from on-farm storage and $10 per ton to haul grain from the field. Growers in this study have the wheat hauled by a contract hauling company and a transportation rate used in this study is $8 per ton for transporting from the field to storage.

8. YIELDS & RETURNS:

Yields: The yield for wheat grown under these conditions in Yolo County used in this study is 1,891 per acre. Yield variations often occur due to the many environmental factors that can affect dryland farming. During the drought years wheat produced only half of a normal 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. However, federal farm programs can play an important roll in dryland wheat 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. Returns, as shown in Table 7**,** will vary and the yields and prices used in this cost study is, at best, an estimate taking into consideration current situations.

9. RISK:

Risk is caused by various sources of uncertainty which include production, price, and financial. Examples of these are insect damage, a decrease in price, and increase in interest rates. The risks associated with producing wheat in the Yolo County under non tillage, dryland conditions should not be minimized. While this study makes every effort to model a production system based on typical, real world practices, it cannot fully represent financial, agronomic and market risks which affect the profitability and economic viability of wheat production. Additionally, some of the equipment required to plant. grow, and harvest wheat can be very capital intensive. Growers should consider all of the agronomic and economic risks before committing resources to wheat production in the Yolo County.

10. LABOR:

Hourly wages for workers is $6.50 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 $8.71 per hour for both machine labor and non-machine labor. Some of the labor supplied to the farms may be 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.

11. 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.

Property Taxes: 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. For this study, county taxes are calculated as 1% of the average value of the property. Average value equals new cost plus salvage value divided by 2 on a per acre basis.

Interest On Operating Capital: 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.

Insurance: Insurance for farm investments vary depending on the assets included 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 $960 for the entire farm or $0.56 per acre.

Office Expense: 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.

12. NON-CASH OVERHEAD:

Non-cash overhead is comprised of depreciation and interest charged on equipment and other investments. Although farm equipment on typical farm in the Yolo County is often purchased used, this study shows the 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: 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 On Investment: 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, buildings, and equipment. Interest is calculated as the average value of the investment during its useful life, multiplied by 3.72% per year. Average value for equipment and buildings equals new cost plus salvage value divided by 2 on a per acre basis.

Average Value: 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 sector 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 only be used effectively in the agricultural sector.

13. 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 5 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.

14. ACKNOWLEDGMENT:

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Table 1. U.C. COOPERATIVE EXTENSION
COSTS PER ACRE TO PRODUCE WHEAT
DRYLAND & NO-TILL CONDITIONS
YOLO COUNTY - 1994

Labor Rate: $8.71/hr. machine labor
$8.71/hr. non-machine labor
Interest Rate: 7.89%
Yield per Acre: 18.91 Cwt

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:							
Plant	0.17	1.74	14.02	36.65	0.00	52.40	
Apply Herbicide	0.05	0.52	0.20	32.75	0.00	33.48	
Pickup Truck Use	0.17	1.74	1.94	0.00	0.00	3.68	
TOTAL CULTURAL COSTS	0.38	3.99	16.16	69.40	0.00	89.56	
Harvest:							
Combine Grain	0.14	2.99	7.06	0.00	0.00	10.05	
Haul To Market	0.00	0.00	0.00	0.00	7.60	7.60	
TOTAL HARVEST COSTS	0.14	2.99	7.06	0.00	7.60	17.65	
Interest on operating capital @ 7.89%						4.30	
TOTAL OPERATING COSTS/ACRE		6.98	23.22	69.40	7.60	111.51	
TOTAL OPERATING COSTS/CWT						5.90	
CASH OVERHEAD:							
Share Rent @ 20% of Gross Returns						21.18	
Office Expense						20.00	
Liability Insurance						0.56	
Property Taxes						1.99	
Property Insurance						1.42	
Investment Repairs						6.17	
TOTAL CASH OVERHEAD COSTS						51.31	
TOTAL CASH COSTS/ACRE						162.82	
TOTAL CASH COSTS/CWT						8.61	

U.C. COOPERATIVE EXTENSION
DRYLAND & NO-TILL CONDITIONS
YOLO COUNTY - 1994
Table 1. Continued

NON-CASH OVERHEAD:

Investment	Per producing Acre	Annual Cost — Depreciation	Annual Cost — Interest @ 3.72%	
Shop Buildings	42.58	2.13	0.79	2.92
Shop Tools	6.41	0.58	0.13	0.71
Fuel Tanks	21.31	1.07	0.40	1.46
Truck Tractor 2 Axle	46.65	8.40	0.95	9.35
Trailers - 2 Each	23.32	4.20	0.48	4.68
Trailer - Lowbed	5.83	0.35	0.12	0.47
Storage Shed	14.38	0.65	0.29	0.94
Seed Truck	10.01	0.60	0.20	0.81
Equipment Shed	9.07	0.41	0.19	0.59
Fuel Wagon	2.46	0.11	0.05	0.16
Carryall	8.07	0.48	0.17	0.65
Equipment	175.00	19.39	3.63	23.02
TOTAL NON-CASH OVERHEAD COSTS	365.09	38.36	7.40	45.75
TOTAL COSTS/ACRE				208.57
TOTAL COSTS/CWT				11.03

Table 2. U.C. COOPERATIVE EXTENSION
COSTS AND RETURNS PER ACRE TO PRODUCE WHEAT
DRYLAND & NO-TILL CONDITIONS
YOLO COUNTY -1994

Labor Rate: $8.71/hr. machine labor
$8.71/hr. non-machine labor
Interest Rate: 7.89%

	Quantity/Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Wheat	18.91	Cwt	5.63	106.46	
TOTAL GROSS RETURNS FOR WHEAT - NO-TILL				106.46	
OPERATING COSTS					
Seed:					
Wheat Seed - Serra	100.00	Lb	0.12	12.00	
Fertilizer:					
16-20-0	150.00	Lb	0.10	15.00	
Aqua Ammonia	50.00	Lb	0.193	9.65	
Herbicide:					
Buctril	1.60	Pint	9.74	15.58	
Hoelon 3 EC	1.60	Pint	10.73	17.17	
Custom:					
Market Hauling	0.95	Ton	8.00	7.60	
Labor (machine)	0.80	hrs	8.71	6.98	
Labor (non-machine)	0.00	hrs	0.00	0.00	
Fuel - Gas	0.55	gal	1.17	0.65	
Fuel - Diesel	3.24	gal	0.85	2.75	
Lube				0.51	
Machinery repair				19.31	
Interest on operating capital @ 7.89%				4.30	
TOTAL OPERATING COSTS/ACRE				111.51	
TOTAL OPERATING COSTS/CWT				5.90	
NET RETURNS ABOVE OPERATING COSTS				-5.04	
CASH OVERHEAD COSTS:					
Share Rent @ 20% of Gross Returns				21.18	
Office Expense				20.00	
Liability Insurance				0.56	
Property Taxes				1.99	
Property Insurance				1.42	
Investment Repairs				6.17	
TOTAL CASH OVERHEAD COSTS/ACRE				51.31	
TOTAL CASH COSTS/ACRE				162.82	
TOTAL CASH COSTS/CWT				8.61	

U.C. COOPERATIVE EXTENSION
DRYLAND & NO-TILL CONDITIONS
YOLO COUNTY -1994
Table 2. Continued

NON-CASH OVERHEAD COSTS (DEPRECIATION & INTEREST):	
Shop Buildings	2.92
Shop Tools	0.71
Fuel Tanks	1.46
Truck Tractor 2 Axle	9.35
Trailers - 2 Each	4.68
Trailer - Lowbed	0.47
Storage Shed	0.94
Seed Truck	0.81
Equipment Shed	0.59
Fuel Wagon	0.16
Carryall	0.65
Equipment	23.02
TOTAL NON-CASH OVERHEAD COSTS/ACRE	45.75
TOTAL COSTS/ACRE	208.57
TOTAL COSTS/CWT	11.03
NET RETURNS ABOVE TOTAL COSTS	-102.11

U.C. COOPERATIVE EXTENSION

Table 3. MONTHLY CASH COSTS PER ACRE TO PRODUCE WHEAT - ANNUAL ROTATION
DRYLAND & NO-TILL CONDITIONS
YOLO COUNTY - 1994

Beginning NOV 93 Ending OCT 94	NOV 93	DEC 93	JAN 94	FEB 94	MAR 94	APR 94	MAY 94	JUN 94	JUL 94	AUG 94	SEP 94	OCT 94	TOTAL
Cultural:													
Plant	52.40												52.40
Apply Herbicide			33.48										33.48
Pickup Truck Use	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46					3.68
TOTAL CULTURAL COSTS	52.86	0.46	33.94	0.46	0.46	0.46	0.46	0.46					89.56
Harvest:													
Combine Grain								10.05					10.05
Haul To Market								7.60					7.60
TOTAL HARVEST COSTS								17.65					17.65
Interest on oper. capital	0.35	0.35	0.57	0.58	0.58	0.58	0.59	0.70					4.30
TOTAL OPERATING COSTS/ACRE	53.21	0.81	34.51	1.04	1.04	1.04	1.05	18.81					111.51
TOTAL OPERATING COSTS/CWT	2.81	0.04	1.82	0.05	0.05	0.06	0.06	0.99					5.90
OVERHEAD:													
Share Rent @ 20%									21.18				21.18
Office Expense	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	20.00
Liability Insurance			0.56										0.56
Property Taxes			0.99						0.99				1.99
Property Insurance			0.71						0.71				1.42
Investment Repairs	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	6.17
TOTAL CASH OVERHEAD COSTS	2.18	2.18	4.44	2.18	2.18	2.18	2.18	2.18	25.06	2.18	2.18	2.18	51.31
TOTAL CASH COSTS/ACRE	55.39	2.99	38.95	3.22	3.22	3.22	3.23	20.99	25.06	2.18	2.18	2.18	162.82
TOTAL CASH COSTS/CWT	2.93	0.16	2.06	0.17	0.17	0.17	0.17	1.11	1.33	0.12	0.12	0.12	8.61

U.C. COOPERATIVE EXTENSION

Table 4. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS
DRYLAND & NO-TILL CONDITIONS YOLO COUNTY - 1994

ANNUAL EQUIPMENT COSTS

Yr	Description	Price	- Non-Cash Over. - Yrs Life	Depre-ciation	- Cash Overhead - Interest	Insur-ance	Taxes	Total
94	160 HP Crawler	117925	12	8844.33	2412.75	462.44	648.59	12368.11
94	ATV - 4WD	3700	10	333.00	75.70	14.51	20.35	443.56
94	Bankout Wagon - SP[1]	63523	10	5717.10	1299.68	249.10	349.38	7615.26
94	Combine W/24' Head	117975	10	10017.70	2525.38	484.03	678.87	13705.98
94	Drill - Notill 13'	135552	6	20366.60	2769.61	530.84	744.52	24411.57
94	Pickup Truck - 3/4 Ton	31800	10	2862.00	650.63	124.70	174.90	3812.23
94	Sprayer - 110 Gal	3125	10	281.20	63.95	12.26	17.19	374.60
TOTAL		473600		48421.93	9797.70	1877.88	2633.80	62731.31
60% of New Cost [2]		284160		29053.16	5878.62	1126.73	1580.28	37638.79

[1] SP = self propelled [2] Used to reflect a mix of new and used equipment.

ANNUAL INVESTMENT COSTS

Description	Price	- Non-Cash Over. - Yrs Life	Depre-ciation	------ Cash Overhead ------ Interest	Insur-ance	Taxes	Repairs	Total
INVESTMENT								
Carryall	13835	15	830.07	283.07	54.26	76.09	461.00	1704.49
Equipment Shed	15551	20	699.80	318.17	60.98	85.53	311.00	1475.48
Fuel Tanks	36545	20	1827.25	679.74	130.28	182.72	50.00	2869.99
Fuel Wagon	4226	20	190.15	86.47	16.57	23.24	158.00	474.43
Seed Truck	17160	15	1029.60	351.09	67.29	94.38	858.00	2400.36
Shop Buildings	73032	20	3651.60	1358.40	260.36	365.16	75.00	5710.52
Shop Tools	11000	10	990.00	225.06	43.14	60.50	100.00	1418.70
Storage Shed	24668	20	1109.95	504.75	96.74	135.69	493.00	2340.13
Trailer - Lowbed	10000	15	600.00	204.60	39.21	55.00	67.00	965.81
Trailers - 2 Each	40000	5	7200.00	818.40	156.86	220.00	0.00	8395.26
Truck Tractor 2 Axle	80000	5	14400.00	1636.80	313.72	440.00	8000.00	24790.52
TOTAL INVESTMENT	326017		32528.42	6466.55	1239.41	1738.31	10573.00	52545.69

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Price/ Unit	Unit	Total Cost
Liability Insurance	1715.00	Acre	0.56	960.40
Office Expense	1715.00	Acre	20.00	34300.00
Share Rent @ 20% of Gross	130.00	Acre	21.18	2753.40

Table 5.

U.C. COOPERATIVE EXTENSION
HOURLY EQUIPMENT COSTS
YOLO COUNTY - 1994

Yr	Description	Actual Hours Used	COSTS PER HOUR: Non-Cash Over. - Depreciation	Interest	Cash Overhead - Insurance	Taxes	Operating - Repairs	Fuel & Lube	Total Oper.	Total Costs/Hr.
94	160 HP Crawler	999.7	5.31	1.45	0.28	0.39	5.90	9.08	14.98	22.40
94	ATV - 4WD	249.2	0.80	0.18	0.03	0.05	0.89	1.35	2.24	3.31
94	Bankout Wagon - SP[1]	199.6	17.19	3.91	0.75	1.05	15.27	1.22	16.49	39.39
94	Combine W/24' Head	199.4	30.14	7.60	1.46	2.04	21.44	8.51	29.95	71.18
94	Drill - Notill 13'	199.6	61.23	8.33	1.60	2.24	67.98	0.00	67.98	141.37
94	Pickup Truck - 3/4 Ton	199.6	8.60	1.96	0.37	0.53	7.64	4.04	11.68	23.14
94	Sprayer - 110 Gal	119.5	1.41	0.32	0.06	0.09	1.57	0.00	1.57	3.45

[1] SP = self propelled

Table 6.

U.C. COOPERATIVE EXTENSION
RANGING ANALYSIS
YOLO COUNTY - 1994

COSTS PER ACRE AT VARYING YIELDS TO PRODUCE NO-TILL WHEAT

	YIELD (CWT/ACRE) 13.24	15.13	17.02	18.91	20.80	22.69	24.58
OPERATING COSTS/ACRE:							
Cultural Cost	90	90	90	90	90	90	90
Harvest Cost	5	9	14	19	23	28	33
Interest on operating capital	4	4	4	4	4	4	4
TOTAL OPERATING COSTS/ACRE	98	103	108	113	117	122	127
TOTAL OPERATING COSTS/CWT	19.69	10.31	7.19	5.63	4.69	4.06	3.62
CASH OVERHEAD COSTS/ACRE	51	51	51	51	52	52	52
TOTAL CASH COSTS/ACRE	149	154	159	164	169	174	178
TOTAL CASH COSTS/CWT	29.84	15.41	10.60	8.19	6.75	5.79	5.10
NON-CASH OVERHEAD COSTS/ACRE	40	42	44	46	48	50	52
TOTAL COSTS/ACRE	189	196	203	210	217	224	230
TOTAL COSTS/CWT	37.78	19.61	13.54	10.50	8.68	7.46	6.58

U.C. COOPERATIVE EXTENSION
RANGING ANALYSIS
YOLO COUNTY - 1994
Table 6. Continued

NET RETURNS PER ACRE ABOVE OPERATING COSTS FOR NO-TILL WHEAT

PRICE	YIELD (CWT/ACRE)						
(DOLLARS PER CWT)	5	10	15	20	25	30	35
4.00	-78	-63	-48	-33	-17	-2	13
4.50	-76	-58	-40	-23	-5	13	31
5.00	-73	-53	-33	-13	8	28	48
5.50	-71	-48	-25	-3	20	43	66
6.00	-68	-43	-18	7	33	58	83
6.50	-66	-38	-10	17	45	73	101
7.00	-63	-33	-3	27	58	88	118

NET RETURNS PER ACRE ABOVE CASH COSTS FOR NO-TILL WHEAT

PRICE	YIELD (CWT/ACRE)						
(DOLLARS PER CWT)	5	10	15	20	25	30	35
4.00	-129	-114	-99	-84	-69	-54	-38
4.50	-127	-109	-91	-74	-56	-39	-21
5.00	-124	-104	-84	-64	-44	-24	-3
5.50	-122	-99	-76	-54	-31	-9	14
6.00	-119	-94	-69	-44	-19	6	32
6.50	-117	-89	-61	-34	-6	21	49
7.00	-114	-84	-54	-24	6	36	67

NET RETURNS PER ACRE ABOVE TOTAL COSTS FOR NO-TILL WHEAT

PRICE	YIELD (CWT/ACRE)						
(DOLLARS PER CWT)	5	10	15	20	25	30	35
4.00	-169	-156	-143	-130	-117	-104	-90
4.50	-166	-151	-136	-120	-104	-89	-73
5.00	-164	-146	-128	-110	-92	-74	-55
5.50	-161	-141	-121	-100	-79	-59	-38
6.00	-159	-136	-113	-90	-67	-44	-20
6.50	-156	-131	-106	-80	-54	-29	-3
7.00	-154	-126	-98	-70	-42	-14	15

Table 7. U.C. COOPERATIVE EXTENSION
ENERGY REQUIREMENTS FOR WHEAT PRODUCTION
NON TILLAGE - ANNUAL ROTATION
WHEAT - DRYLAND
YOLO COUNTY - 1994

Operating Input	Quantity/Acre	Unit	kcal/Acre
Seed			
Wheat	100	Lb	300,200
Fertilizer			
Aqua Ammonia	250	Lb	303,175
16-20-0	150	Lb	195,450
Herbicide			
Buctril	0.20	Gal	18,109
Hoelon 3EC	0.20	Gal	27,164
Custom/Contract/Rental			
Haul	1891	Lb	190,613
Fuel			
Gasoline	0.55	Gal	17,027
Diesel	3.24	Gal	116,491
Machinery			
Total Equipment			12,863
Investments			
Total Investment			24,869
Labor			
Total Labor	0.80	Hours	
TOTAL INPUT		kcal	1,205,960
OUTPUT			
Wheat Yield	1891	Lb	2,823,607
EFFICIENCY			
kcal output/kcal input ratio			**2.34**
kcal output/labor hour ratio			3,529,509

U.C. COOPERATIVE EXTENSION
MONTHLY CASH COSTS TO PRODUCE WHEAT - TWO YEAR ROTATION

Table 8.

DRYLAND AND NON TILLAGE SYSTEM
YOLO COUNTY - 1994

Beginning Ending 94	FEB 93 JUL	FEB 93	MAR 93	APR 93	MAY 93	JUN 93	JUL 93	AUG 93	SEP 93	OCT 93	NOV 93	DEC 93	JAN 94	FEB 94	MAR 94	APR 94	MAY 94	JUN 94	JUL 94	TOTAL
Cultural:																				
Apply Herbicide		7.89											33.48							41.37
Plant											52.40									52.40
Pickup Truck Use		0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22		3.68
TOTAL CULTURAL COSTS		8.11	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	52.62	0.22	33.69	0.22	0.22	0.22	0.22	0.22		97.45
Harvest:																				
Combine Grain																		10.05		10.05
Haul To Market																		7.60		7.60
TOTAL HARVEST COSTS																		17.65		17.65
Interest on operating capital		0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.41	0.41	0.63	0.64	0.64	0.64	0.64	0.76		5.29
TOTAL OPERATING COSTS/ACRE		8.16	0.27	0.27	0.27	0.28	0.28	0.28	0.28	0.28	53.03	0.63	34.33	0.85	0.85	0.85	0.86	18.62		120.39
TOTAL OPERATING COSTS/CWT		0.43	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	2.80	0.03	1.82	0.05	0.05	0.05	0.05	0.98		6.37
OVERHEAD:																				
Share Rent @ 20% of Gross Returns																			21.18	21.18
Office Expense		1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67							20.00
Liability Insurance													0.56							0.56
Property Taxes							1.00						1.00							1.99
Property Insurance							0.71						0.71							1.42
Investment Repairs		0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51							6.17
TOTAL CASH OVERHEAD COSTS		2.18	2.18	2.18	2.18	2.18	3.89	2.18	2.18	2.18	2.18	2.18	4.45						21.18	51.32
TOTAL CASH COSTS/ACRE		10.34	2.45	2.45	2.45	2.46	4.17	2.46	2.46	2.46	55.21	2.81	38.77	0.85	0.85	0.85	0.86	18.62	21.18	171.71
TOTAL CASH COSTS/CWT		0.55	0.13	0.13	0.13	0.13	0.22	0.13	0.13	0.13	2.92	0.15	2.05	0.05	0.05	0.05	0.05	0.98	1.12	9.08