

Rice Straw Diversion Plan

California Air Resources Board

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PREFACE

This report was written by Lesha Hrynychuk under the supervision of Terry McGuire, Chief of the Technical Support Division. Copies of this report may be obtained by calling the Public Information Office at (916) 322-2990 or via the Internet at the following address:
<http://www.arb.ca.gov/rice/ricefund/ricefund.htm>

EXECUTIVE SUMMARY

State legislation requires the Air Resources Board to develop an implementation plan and schedule to find uses for 50 percent of the rice straw from the Sacramento Valley by the year 2000. The burning of rice straw has been phasing down over the last seven years, leaving rice growers with the only available option of plowing the straw into the soil. Some growers object to soil incorporation because it is costly, may be conducive to crop diseases, and presents logistics problems.

In recent years, about 500,000 acres have been annually planted in rice in the Sacramento Valley. When the fields are burned, about 3 tons of straw are burned per acre. However, when the straw is harvested, only about 2.25 tons of straw can be removed from an acre. Thus, the total yield is about 1.125 million tons of straw annually. This Rice Straw Diversion Plan targets finding uses for about 562,500 tons of rice straw, which is 50 percent of the total straw yield on 500,000 acres.

Not all of the straw grown is expected to be available for harvest. Four factors which would limit straw availability are disease burning, preferred incorporation, hunting clubs, and poor straw condition. These four factors could decrease the availability of straw by up to 50 percent.

Since only about 13,500 tons of rice straw are currently used off-field, increasing the use by more than 50-fold will require a tremendous effort. Many issues need to be resolved before a successful market can be created for 50 percent of the straw. A straw infrastructure needs to be created to solve the logistics problems of harvesting, transporting and storing over half-a-million tons of straw within the six-to-eight-week harvest period during the fall. Straw specifications of the end-users of straw also need to be defined.

If additional measures are not implemented, forecasts call for 3 percent use of rice straw in 2000 and about 20 percent use in 2003. If the Legislature were to implement additional measures, the earliest, practical date by which resources could be appropriated would be during late 1999 or early 2000. This would allow only about 9 months to develop and implement programs that could affect the September 2000 straw harvest. There are very few straw usage categories which could be targeted in such a short time frame.

To comply with the SB 318 requirement for a 50 percent diversion plan, the ARB staff has identified two approaches which would achieve the 50 percent goal on the most expeditious schedule possible. One approach is targeted to divert 50 percent in the year 2000, as required in the legislation. However, meeting the diversion goal by this date could be accomplished only with large subsidies and even then would face substantial logistic and technical difficulties. For this 2000 plan, a dairy and cattle feed marketing program could be pursued, which would include a \$20 per ton subsidy, to induce dairy and cattle ranchers to buy rice straw for animal feed. This subsidy, totaling almost \$10 million annually, would need to continue until other uses of rice straw were developed.

Because of the extreme difficulty and high cost of achieving a 50 percent diversion by the year 2000, the ARB also identified an alternative plan targeted at the year 2003. The approaches for diverting 50 percent of rice straw by 2003 include appropriating resources for analyzing straw production, harvest and availability; funding to build straw storage facilities; funding for prospective straw businesses; assisting potential straw businesses in developing viable business plans; directing state agencies to use and promote rice straw products; and modifying the Rice Straw Tax Credit Program.

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CHAPTER 1 - INTRODUCTION

Senate Bill 318 (1997, Thompson) requires the Air Resources Board to "...develop an implementation plan and a schedule to achieve diversion of not less than 50 percent of rice straw produced toward off-field uses by 2000." This plan and schedule are to be developed in consultation with the Department of Food and Agriculture (CDFA), the Advisory Committee on Alternatives to Rice Straw Burning (Alternatives Committee) and the Trade and Commerce Agency (TCA).

This document, *The Rice Straw Diversion Plan* (the Plan), was written to fulfill the SB318 requirement. The text of SB318 is included as Appendix A. The Plan was developed with the input of many stakeholders, including the three specified by the bill--the CDFA, the Alternatives Committee and the TCA. Other participating stakeholders include representatives of the following groups: rice growers and the rice industry, environmental community and public health advocates, rice straw businesses and entrepreneurs, and local community groups. Numerous meetings and telephone conversations were held with these stakeholders in both developing and reviewing this Plan, and many of their suggestions have been included in this Plan.

Little more than a year ago, the prospect of finding uses for significant amounts of rice straw was bleak. Since that time, however, the forecast has improved significantly. Although only 3 percent of straw is now estimated to be used off-field by the year 2000, about 20 percent is forecasted to be used by 2003, without additional assistance from government. However, to achieve 50 percent diversion, additional measures would be needed. Candidate measures are suggested in this document.

Before a problem can be solved, its constituent parts must first be defined and understood. To this end, background information is first presented, followed by a discussion of the important issues which need to be resolved. Chapter 4 presents estimates of current uses of rice straw and Chapter 5 presents future estimates without instituting additional measures. Chapter 6 presents plans for 50 percent diversion by 2000 and 2003.

CHAPTER 2 - BACKGROUND

Rice Production

California holds the second rank among states in the nation in acreage planted to rice. About 95 percent of California's rice is grown in the Sacramento Valley, where it is the most widely planted crop. In recent years, about 500,000 acres of rice have been planted in the Sacramento Valley, producing over a million tons of straw annually. After the rice has been harvested, the straw has traditionally been burned to clear the fields.

Phase Down Act

With the passage of the Connelly-Areias-Chandler Rice Straw Burning Reduction Act of 1991 (the Phase Down Act), rice growers have had to reduce the number of acres burned according to a schedule expressed in terms of progressively declining percentages of planted rice acreage. When the Act was written, it was anticipated that a new market for rice straw would be created that would provide an alternative to burning rice straw. However, seven years into the phase down, when only 32 percent of the rice acreage was allowed to be burned, only about 13,500 tons of straw have found uses off the field. Approximately 98 percent of the straw not burned continues to be incorporated into the soil, a practice that the rice growers object to because they believe it is costly, may be conducive to increased incidence of crop diseases, and causes logistics problems with field management.

In its 1997 status report, the Alternatives Committee estimated that, at the current rate of development, only two percent of the straw produced in the year 2000 would find commercial uses and that little had changed since its previous status report two years prior.

Tax Credit Program

The Rice Straw Utilization Tax Credit Program was established by Senate Bill 38 (Lockyer) to provide a California state income tax credit of \$15 for each ton of California-grown rice straw purchased and used off-field. The CDFA administers the program, which limits the aggregate amount of tax credits issued to all taxpayers to \$400,000 per year for the 11-year program. This limit represents 26,667 tons of rice straw, or about 12,000 acres. During 1997, the first year of the program, the CDFA issued tax credit certificates for the utilization of 6,034 tons of straw. The primary recipients of the tax credits were from the dairy industry in the San Joaquin Valley, which used the straw for animal feed and bedding. The first year of the tax credit program is described in the CDFA Report to the Legislature and is included as Appendix B.

Advisory Committee on Alternatives to Rice Straw Burning

The Phase Down Act created the Advisory Committee on Alternatives to Rice Straw Burning "...to assist with the identification and implementation of alternatives to rice straw burning... and ...to develop a list of priority goals for the development of alternative uses of rice straw..." Over the last six years, the Alternatives Committee has identified many potential uses of rice straw, ranging from building materials to electricity generation to animal feed.

In its 1997 status report, the Alternatives Committee evaluated the technological process and constraints, the economic feasibility, and commercial development status of each identified alternative. Technical barriers to developing rice straw products include rice straw's high silica and ash contents. Economic barriers include the high cost of starting up a new facility, the difficulty in attracting investors to a project which may have a relatively low rate of return, and the uncertainty of a steady supply and cost of a new raw material, that is, rice straw. Although technical barriers remain to various degrees for some potential rice straw uses, the primary barrier for most appears to be economic in nature.

Senate Bill 318

In 1997, when the Phase Down Act limited rice straw burning to 38 percent of the acreage planted and less than one percent of straw was used off-field, rice growers turned to the California Legislature seeking relief from the phase down. The resulting legislation, Senate Bill 318, authored by Senator Mike Thompson, provided the opportunity for additional burning for three years; created a two-year, \$5 million grant program to help create a market for rice straw; and directed the ARB to develop a plan to use 50 percent of the straw by the year 2000.

Rice Fund

The Rice Straw Demonstration Project Fund (Rice Fund) was created by Senate Bill 318 to provide cost-sharing grants for projects which would use significant quantities of Sacramento Valley rice straw. The ARB, who administrates the program, awarded three grants totaling \$2.07 million at its public meeting on May 28, 1998. The three grant recipients are Anderson Hay & Grain, Inc., FiberTech U.S.A., Inc., and MBI International. A summary of the three projects is included in Appendix C. Anderson will work on developing the straw infrastructure, exporting rice straw for cattle feed, and manufacturing erosion control blankets. FiberTech is expected to start manufacturing particle board from rice straw early 1999 and will be the first significant user of rice straw. MBI will work on a pilot plant to produce high-value animal feed which, if successful, will be the precursor to a full-scale plant using very large amounts of rice straw. The second and final round of grant awards is in progress, with 12 grant requests currently being evaluated. The ARB is expected to award grants totaling \$2.25 million at its April 1999 public meeting.

CHAPTER 3 - IMPORTANT ISSUES

In the ideal situation, rice straw products would have been gradually phased into the marketplace as the burning of rice straw was phased down. Unfortunately, this has not been the case. Since the Phase Down started in 1992, the demand for rice straw has remained low relative to supply, increasing to only about 13,500 tons the last year. Discussed below are the important issues that need to be resolved to achieve the goal of large-scale uses of rice straw.

Straw Production/Yield

Each year during the last 18 years, between 300,000 and 550,000 acres of rice have been planted in the Sacramento Valley. During the past several years, it has remained at about 500,000 acres. The Rice Promotion Board estimates either steady or increasing acreage in future years.

The rice industry and rice agronomists generally estimate that for each ton of harvested grain, about one ton of straw is grown, that is a one-to-one ratio of harvested grain to straw grown. The grain harvest (yield) varies yearly and also depends on the variety of rice grown. The grain yield of individual fields ranges from 3 to 4.5 tons per acre, and in recent years the average yield in California has been about 3.75 to 4 tons per acre. Using the one-to-one ratio, about 3.75 to 4 tons of straw would be grown per acre.

Of course, not all of the straw grown would be recoverable. According to a study by the University of California at Davis, Department of Agronomy and Range Science, when the fields are burned, about 3 tons of straw are removed per acre. Harvesting and baling the straw results in 42 to 59 percent removal or about 2 tons per acre. This estimate is close to the yield estimates of three other sources described below.

Under a USDA grant, the University of California at Davis (UCD) has been conducting a five-year study titled, "Rice Straw Harvesting and Handling for Off-Field Utilization" (UCD Project). During the 1997 straw harvest, the project investigators found that the straw yield (amount harvested) from the fields (776 acres) studied varied from 1 to 4 tons per acre, with an average of 2.2 tons per acre. The circumstances explaining such a wide range of straw production are not known. Two Rice Fund grant recipients have recently begun harvesting straw for their projects. FiberTech's and Anderson Hay and Grain's 1998 straw harvest range from 2 to 2.5 and from 2 to 2.75 tons per acre, respectively.

Since extensive, historical data on rice straw harvesting do not exist, only a rough estimate of straw yield can be made at this time. Known factors affecting straw production include weather conditions, rice variety, grain yield, method of harvesting the grain and the method of harvesting the straw.

Further investigation needs to be done to better estimate straw yield. Based on the four sources discussed above, an estimate of 2.25 tons per acre straw yield will be used, until better estimates become available. Therefore, the goal of diverting 50 percent of the straw towards off-field uses

will target using 562,500 tons of straw, which is 50 percent of the 2.25 tons per acre yield on 500,000 acres planted.

Straw Availability

Although rice straw is grown on about 500,000 acres, not all of the acreage would be available for harvest. Four factors limiting the availability of straw harvest are discussed below.

- **Disease Burning:** The final phase of the modified Phase Down Act permanently allows up to 25 percent of rice acres to be burned for disease management starting September 2001. The rice industry has stated on many occasions that they expect the full 25 percent would be used for burning. Therefore, assuming at least some burning continues to be needed to manage disease, up to 25 percent of straw would not be available for off-field uses.
- **Preferred Incorporation:** A number of rice growers prefer to incorporate their straw because it is less costly or because they follow the organic-farming philosophy of not burning. It is not known how many acres may fall into this category of *preferred incorporation*, but estimates of 5 to 10 percent have been made. It is also unknown how many of these growers would prefer to harvest their straw if the cost for straw disposal changes.
- **Hunting Clubs:** Some growers manage their rice fields for the use of hunting clubs during the winter by leaving the straw standing then flooding the fields which attracts ducks and other aquatic birds. During the spring, the partially decomposed straw is incorporated into the soil. Rough estimates of about 50,000 acres fall into this category, translating to about 10 percent of planted acreage.
- **Poor Straw Condition:** An additional unknown percentage of straw may not be suitable for off-field uses because of its diseased or otherwise poor condition. An estimate of 5 to 10 percent will be used for this report.

Table 1
Estimates of Unavailable Rice Straw
(% of acres planted)

Disease Burning	25%
Incorporation Preferred	5% to 10%
Hunting Clubs	10%
Poor Condition	5% to 10%
Total:	45% to 55%

Using the estimates of reduced straw availability due to the four categories discussed above, 45 to 55 percent of straw may not be available for off-field uses. The goal of achieving diversion of at least 50 percent of the rice straw produced may not be practical, since it might approach, or even exceed, 100 percent of the straw that is available. Some stakeholders have suggested that, because 50 percent of the straw may not be available for harvest, a more realistic goal of the 50 percent diversion plan would be to target using 281,250 tons of straw or 50 percent of the straw available.

Straw Infrastructure

The lack of a rice straw supply infrastructure is a common concern of rice growers and potential straw users alike. A rice straw supply infrastructure is defined as those activities needed to get the straw from the field to the final end-user of the straw. These activities would encompass harvesting, transporting, distributing and storing the straw. The issues involved with each of these activities are discussed below. Additional activities might include pre-processing the straw to meet end-users' specifications, compressing the straw for greater densification, and the creation of a straw distribution network.

The lack of a long-term contract or other assurances of a steady, stable supply of raw material (rice straw) "creates a big hole" in a business plan, according to many potential straw users. Rice growers have stated that they are reluctant to commit to a long-term contract for the following reasons: if the straw buyer were not successful in starting up his or her business, the rice grower would be left with, perhaps, hundreds or thousands of bales of straw that could not be burned; if the grower's straw production fell short of the contract commitment, the grower would have to purchase straw from another grower and pay for the higher cost; and, the future cost/price of straw may increase, leaving the grower committed to sell the straw at the lower, original contract price.

Straw Harvesting

The normal rice harvest period is from about mid-September through the end of October, for most of the rice grown in the Sacramento Valley. However, depending on the weather, harvest may begin during late August or continue into December. Harvesting must be done when the fields are drained of water, otherwise the harvesting equipment tends to rut up the fields. It is assumed that rice straw destined for most off-field uses would need to be harvested during the fall, soon after the grain is harvested but before the winter rainy season begins. This creates a very short time frame (six to eight weeks) in which most of the straw would need to be harvested. During those years when early rains abruptly terminate much of the straw harvest, enough straw would have to be stored from previous years to ensure a steady supply for all straw users.

Straw Harvesting Costs

The UCD Straw Harvesting Project team performed time and motion studies of rice straw harvesting on 766 acres during the first year of its five-year project. The resulting estimates of direct costs of harvesting ranged from \$10.84 to \$30.87 a ton, depending on harvesting method, type of equipment, and bale size. The Alternatives Committee quoted the Foster Report estimate

of \$19.40 per ton (small bale) using the least-cost harvesting options. All the above estimates are for harvesting the straw and stacking the bales by the edge of the field, next to a road, called *road-siding*.

Straw Transportation

After road-siding, the bales would be either placed in storage located on the rice grower's property, transported to a distribution storage facility, or transported to the end-user's storage facility. Transporting 562,500 tons of straw would require a tremendous amount of transportation resources. Using the estimate of 20 tons of straw-per-truck-load, it would require 28,000 truck loads. If all this straw were to be transported during the four to eight week fall harvest period, it would require 3,500 to 7,000 truck loads per week to transport the 50 percent goal of 562,500 tons of straw. This would amount to 50 to 100 truck-loads-per-hour, at 10 hours per day, 7 days per week. It is not known whether or how this large amount of needed transportation resources could be met. It is unlikely that there is that much excess transportation capacity currently waiting to be used, and, therefore, new transportation resources would need to be developed. This also points to the need for straw storage on or near the rice growers' fields, so that the transportation to the end-users' facilities could be scheduled throughout the year.

Transportation costs within a 10-mile radius are estimated at about \$10 per ton including loading and unloading the straw (Anderson Hay & Grain Co.). Transportation to a location 50 miles away would be about \$20 per ton. If the demand for transportation abruptly increases, greatly out-pacing supply, transportation costs may also abruptly increase, until the supply and demand level off. This points to the need of an analysis of transportation availability and costs and its environmental effects.

Straw Storage

Potential straw users would need a supply of straw on a year-round basis to produce their rice straw products continuously. Since rice straw would be harvested primarily during the fall months, each potential straw user would need to secure a full year's supply during the fall straw harvest. The straw could be stored either at the user's facility or at the straw supplier's facility (here, the straw supplier could be a rice grower, a broker, or a pre-processor).

In addition, enough straw would have to be stored from the previous year in case of a poor harvest during the upcoming year, such as the case when early rains prematurely terminate the straw harvest. This carry-over would be necessary to ensure a steady, stable supply for the straw users. Individual straw users would have to determine the prudent amount necessary for carry-over.

Most potential straw users need straw to be kept in dry storage, such as pole barns or under tarps. Five years ago storage costs were estimated at \$1 to \$4 per ton of straw stored (Alternatives Report page 57). More recently, Anderson Hay and Grain Company estimated the capital cost of a 2,550 ton capacity straw storage barn to be \$162,500. Anderson also estimated yearly tarping costs at \$1.76 per ton straw. Storage location could be next to a rice field, at the end-user's

facility, or at a distribution or pre-processing center. A cost analysis needs to be performed listing all practical options and the parameters affecting storage costs. Currently, there is very little straw storage available in the Sacramento Valley.

Creating a Straw Market

In the ideal situation, rice straw businesses would have phased into the marketplace along the same gradual time line as the mandated 10 percent yearly reduction in straw burning. If this were the case, the rice straw supply infrastructure would gradually develop to meet the gradually increasing demand for rice straw. The availability of harvesting equipment, storage facilities, and transportation options would increase gradually, instead of responding to a sudden surge in demand. The market-determined price of these resources would be determined by the incremental difference in supply and demand.

Soil Incorporation Costs

Currently, 98 percent of the straw not burned is incorporated into the soil. With few exceptions, this has been the only alternative to burning. Rice growers object to soil incorporation for several reasons--it is more costly than burning, it may increase plant disease, and it presents problems with field management in terms of timing and logistics. According to a recent study by the University of California Cooperative Extension Service (1997 Report to the Legislature-Appendix E) , it costs an average of about \$36 an acre to incorporate straw into the soil. This is the incremental cost beyond the normal soil management costs. While the costs of incorporation ranged from \$8 to \$77 per acre, 60 percent of the farms studied were in the range of \$18 to \$48 per acre. From this perspective, rice straw is currently considered a liability, with a disposal cost equal to the cost of incorporation.

Market Price of Straw

Currently, the available supply of rice straw greatly exceeds the demand. It is unlikely that the market for rice straw would change suddenly so that straw moves from being a liability to an asset. The economic value of straw as a liability can be quantified as the cost of incorporation less the cost of burning, which currently averages \$36 per acre. Because of this, some rice growers are willing to initially pay for some of the straw removal costs, thereby making this new raw material (rice straw) more attractive to potential rice straw enterprises. Some rice growers have stated their goal of making straw disposal *revenue-neutral*. Currently, the market price of rice straw ranges from about \$15 to \$35 a ton. This range does not include smaller sales that are priced at around \$3 per bale, which translates to \$75 per ton.

End-user Specifications

Different straw users require different straw specifications. Some users require straw to be chopped to a specific length, or, when harvested, cut at a certain point (above or below the water-line). For many straw uses, the straw must be very clean (no soil contamination) and kept in dry storage. For a few other straw uses, the straw can be harvested and then left out in the open and leached with the winter rains; these straw uses may also be able to utilize spring-harvested straw. The required bale size also differs for the various end-users, and, as previously mentioned, this

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would affect the harvesting cost.

CHAPTER 4 - CURRENT USES OF RICE STRAW

Two sources were used to estimate current alternative uses of rice straw--the Alternatives Committee 1997 progress report and the CDFA 1998 Tax Credit Program report. The Alternatives Report was based on the 1996 crop year, while the CDFA Report was based on the 1997 calendar year. Table 2 lists the estimates from these two sources and a revised estimate combining the two sources with some adjustments, as listed below.

Table 2
Current Uses of Rice Straw
(tons used)

Use Category	Alternatives Report Estimate (1996)	Tax Credit Program Participation (1997)	Revised Estimate
Animal Bedding		2,967*	2,665
Animal Feed	1,350	2,501*	1,860
Compost/Fertilizer		1,264	1,264
Bale Construction	**	50	200
Erosion Control	7,450	460*	7,450
TOTAL	8,800	6,657	13,439

* Numbers revised because multiple categories were given for straw usage, resulting in double-counting

** Estimate not quantified

The Tax Credit Program would not include straw used by governmental agencies since they would not have tax liabilities necessary to use the tax credit. A common use of straw by governmental agencies is for erosion control. Therefore, the Alternatives Committee estimate was used for this category.

The actual amount of rice straw currently used may be higher than the estimates shown in Table 2. A comprehensive survey of rice growers, straw balers, straw distributors, and straw end-users would be needed for an accurate estimate of actual rice straw usage.

CHAPTER 5 - FORECASTED STRAW USAGE WITHOUT ADDITIONAL MEASURES

Currently, there are two incentives established to promote rice straw uses: the State Tax Credit Program (expires on December 1, 2008) and the Rice Fund Grant Program (expires at the end of fiscal year 1998-99). Without additional incentives, significant amounts of rice straw are not expected to be used until well after 2003.

In 1997 tax credits were used to purchase 4,525 tons of straw for animal feed and bedding, but future straw use is expected to decline for these categories. According to the CDFA staff report, almost half of all the tax credits issued in 1997 went to the dairy industry. The tax credit offset the transportation costs of transporting the straw from the Sacramento Valley to the San Joaquin Valley, from 50 to 100 miles. In the future, one large-scale straw production facility could use most or all of the annual tax credit, since the annual limit of the tax credit program is \$400,000, or about 26,667 tons of rice straw, and because the tax credit legislation specified that the tax credit certificates be issued on a first-come-first-served basis. When this occurs, small individual users may discontinue using rice straw, especially users who use the tax credit to offset transportation costs, such as the dairies in San Joaquin Valley. Because this potential is likely to occur and because there are fewer dairy and cattle operations in the Sacramento Valley, usage forecasts for these categories were decreased for future years.

Table 3 shows the straw usage forecasts if additional measures are not implemented. The forecasts are for 3 percent usage for the year 2000 and 21 percent usage for 2003.

Table 3
Straw Usage Forecast
Without Additional Measures
 (tons of rice straw)

Straw Usage Category	Year 2000		Year 2003	
	Low	High	Low	High
Energy Alternatives				
Anaerobic Digestion	0	0	0	0
Direct Combustion for Electricity and Heat	0	0	0	0
Ethanol	0	0	0	0
Chemicals	0	0	0	0
Manufacturing/Construction				
Pulp/Paper Mills	0	0	0	20,000
Fiberboard	10,000	20,000	10,000	40,000
Composites/Bricks	0	0	0	0
Bale Buildings	200	1,000	200	1,000
Sound Walls	0	500	0	500
Environmental Mitigation/Compost				
Erosion Blankets	2,000	5,000	6,000	11,000
Bales and Loose Straw	3,000	5,000	3,000	7,000
Compost/Fertilizer	0	1,000	0	1,000
Livestock Utilization				
Domestic Animal Feed	0	500	50,000	100,000
Export Feed	0	0	30,000	40,000
Bedding	0	200	0	1,000
Future Rice Fund Grant Recipients*	0	20,000	50,000	100,000
AVERAGE:	34,200		235,350	
PERCENT OF STRAW PRODUCED:	3%		21%	

*Unknown usage categories for recipients of fiscal year 1998-99 grants

CHAPTER 6 - RICE STRAW DIVERSION PLAN

A. Approaches for Achieving a 50 Percent Diversion by 2000

Even if the necessary funds could be appropriated immediately, an enormous effort would be required to achieve almost 20 times the straw usage that is currently expected for the year 2000. However, because of the lead time required for the legislative process, the earliest, practical date when new funding could be appropriated would be during late 1999 or early 2000. This would allow only about 9 months to develop and implement programs by the September 2000 straw harvest.

There are only a few straw usage categories which could be targeted in such a short time frame, such as animal feed and bedding, erosion control and sound walls. Most of the other categories of straw usage would require about 18 months to build manufacturing facilities which would use rice straw as a raw material.

Straw Infrastructure Development

Funds would need to be appropriated to develop the infrastructure needed for using 562,500 tons of straw. Straw storage facilities would have to be built, straw harvesting equipment would have to be purchased, and trucking resources would have to be acquired.

Erosion Control

There currently exists a market for rice straw (in the form of bales and loose straw) as erosion control material. This market could be increased ten fold by promoting, or even requiring, state and local agencies to use rice straw for erosion control. Developing a marketing plan targeting the construction industry would also increase the use of rice straw for erosion control. The current lack of straw storage facilities limits this market since rice straw is not available year-round. Funds would need to be appropriated to develop the marketing plan and storage facilities. Use of bales or loose straw for erosion control could be increased to about 15,000 tons annually.

Sound Walls

The California Department of Transportation (CalTrans) and the Integrated Waste Management Board have made plans to build a demonstration sound wall using rice straw. If the results of the demonstration project are positive, the State could make a commitment to use rice straw to build a significant percentage of future sound walls, using up to about 3,000 tons of straw annually.

Animal Bedding

In 1997, there were 18 dairies which purchased rice straw for animal bedding, using the \$15 per ton State Tax Credit to offset the cost of transporting the straw to the San Joaquin Valley. These dairies used approximately 2,665 tons of rice straw. The demand for animal bedding is limited by each year's meteorological conditions, that is, by the amount of rainfall during the winter (more rainfall would result in greater demand for straw). The most that could be expected to be used by 2000 would be about 10,000 tons, which is four times the amount used during the 1997 extremely wet winter, by promoting rice straw to other dairy and cattle ranchers.

Animal Feed

The only straw usage category which could possibly be targeted for using the balance of the required 50 percent is for animal feed. In 1997, there were 6 dairy and cattle ranchers who purchased approximately 1,860 tons of rice straw for animal feed, using the \$15 per ton State Tax Credit to offset the cost of transporting the straw to the San Joaquin Valley. To increase this usage over 260-fold, to 490,000 tons, the tax credit may have to be increased to \$20 per ton.

The CDFA estimates the potential market for low-grade feed for cattle at between 1 and 1.3 million tons. Therefore, 490,000 tons of rice straw would have to capture about 50 percent of the market, displacing the feed currently being used. According to the United States Department of Agriculture, the price of alfalfa was \$115 a ton during the past spring. Rice straw has a nutritional value of about 45 percent of alfalfa when used for maintenance. Therefore, the nutritional equivalent cost would be about \$50 per ton. The cost of harvesting rice straw and transporting it to San Joaquin Valley, the location of most of the dairy and cattle ranches, would be about \$50 per ton. It is assumed that additional storage costs would not be incurred, since the rice straw could be stored in the barns which would otherwise store the alfalfa. The \$50 per ton cost and \$50 per ton nutrition equivalency represents the break-even point for rice straw. However, most dairy and cattle ranchers, being skeptical of changing their feed to rice straw, would need a cost incentive to start using rice straw. A \$20 per ton cost advantage, which would represent a 40 percent cost savings, would be a strong incentive for dairy and cattle ranchers to switch to using rice straw for part of their feed requirements.

A marketing plan targeting dairies and cattle feed-lots would also have to be developed to promote the use of rice straw. This would have to include nutritional studies of using rice straw as part of the daily rations. The total tax credit for 490,000 tons of straw would amount to \$9,800,000 per year. This subsidy could be gradually reduced as other, more cost-effective uses of rice straw were developed over time.

Conclusions

The estimates for using 50 percent rice straw by following the approaches discussed above are shown in Table 4. The ARB staff does not believe that these approaches are practical, since they would not work towards a permanent, long-term solution to using over a half-a-million tons of straw annually.

Table 4
Straw Usage Forecast
With 2000 Plan Measures

Straw Usage Category	Tons of Straw
Fiberboard	20,000
Sound Walls	3,000
Bale Buildings	600
Erosion Blankets	3,500
Erosion Control: Bales and Loose Straw	15,000
Animal Bedding	10,000
Future Rice Fund Grant Recipients*	20,000
Subtotal:	72,100
Animal Feed (Balance required for total to equal 50%)	490,000
TOTAL:	562,100
PERCENT OF STRAW PRODUCED	50%

*Unknown usage categories for recipients of fiscal year 1998-99 grants

B. Approaches for Achieving a 50 Percent Diversion for 2003

Because it would be extremely difficult and costly to implement the recommendations for 50 percent diversion by the year 2000 in such a short time, alternative approaches were developed that could, if fully implemented, meet the 50 percent goal by the year 2003. The ARB staff believes that this target date, 2003, is far more viable than 2000.

To achieve diversion of 50 percent of rice straw produced by 2003, additional measures would need to be taken. The approaches listed below were suggested by stakeholders, the Alternatives Committee, the Department of Food and Agriculture, the Trade and Commerce Agency, and Air Resources Board staff. If these approaches were to be implemented according to the schedule outlined in Table 5, the goal of 50 percent diversion could be achieved. Table 6 lists the low and high estimates for each straw usage category.

Measures by Category

Straw Infrastructure

1. Provide resources to perform the following studies: estimates of how much rice straw is actually produced and available for off-field uses; estimates of how much straw is currently being used off-field; evaluation of the options and costs of straw harvesting methods, harvesting equipment, storage, and transportation; evaluation of straw quality characteristics affected by harvesting methods.
2. Provide resources for the following: determine the straw specifications needed by various end-user groups, including length of straw (chopping requirements), quality of straw, bale-size, moisture content, storage requirements, etc.; determine the potential of a secondary straw market, for example, uses for low-quality straw, spring-harvested straw, and straw waste generated by other straw users.
3. Provide financial resources to subsidize the cost of building storage facilities on rice growers' land, central distribution centers, and end-user facilities. The financial incentives could take the form of loan guarantees, low-interest loans, accelerated capital depreciation, 50 percent grants, or tax credits. Provide assistance to rice growers and others to develop straw cooperatives and straw distribution and marketing centers.

Incentives for End-users

4. Provide financial resources for end-user straw businesses. The financial incentives could take the form of 30 percent loan guarantees, low-interest loans, accelerated capital depreciation, or 50 percent grants. This financial incentives program could be made self-supporting by requiring the grant recipient to repay the grant, at some multiple, when the business is self-sufficient. The Rice Straw Demonstration Project Fund, which was created for only two years, could be modified to be self-supporting and extended beyond the 1998-99 fiscal year.

5. Provide financial resources for research projects to address the technical barriers of those straw usage categories which could use significant (at least 50,000 tons) quantities of straw. This could be modeled after the Defense Conversion Matching Grant Program, which required that the results of the research be made public.
6. Provide resources to develop a Rice Straw Business Assistance Program which would educate potential rice straw businesses about existing available programs for federal, state, and local financial and educational assistance. Through this program entrepreneurs would be assisted in the following areas: product marketing and marketing analysis; estimating capital costs; seeking private investors and available public and private grants and loans; environmental and building permitting processes;

Potential Users of Straw Products

7. State agencies should be encouraged to use and promote rice straw products where such use would be appropriate. State Agencies have the potential of becoming significant users and promoters of straw products, such as paper, building materials and bale buildings, sound walls, and straw for erosion control and compost. Local governmental agencies, especially those in the rice-growing counties, also have the same potential, thereby creating a demand for products made from rice straw. The President's September 14, 1998, Executive Order, titled "Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition", could be a model for California. This Executive Order directs federal agencies to use environmentally preferable products including bio-based products which would include products made of rice straw.
8. Modify the Straw Tax Credit Program. Set limit that can be claimed by any one tax payer in order to prevent one large straw user from claiming the entire credit, thereby losing smaller users; do not set a limit on individual users, but, instead, increase the yearly cap to \$8.5 million per year for the first 5 years to cover the entire 562,500 tons, which is 50 percent of the straw produced; allow tax credit trading and marketing to provide incentives to straw users who do not have State tax liabilities.

Table 5
Proposed Schedule for 2003 Diversion Plan

Category	Quarter - Year	Activity
For All Categories	Q4 - 1999	Provide resources, identify responsible agencies
Straw Infrastructure Studies	Q1 2000 - Q1 2001	Perform studies
	Q2 2001 - Q2 2002	Implement findings/Develop Infrastructure
Storage Development	Q2 2000 - Q2 2002	Provide financial assistance/Build storage facilities
Financial Incentives for End-users	Q1-Q2 2000	Establish financial assistance program for commercialization projects
	Q1-Q2 2000	Establish financial assistance program for research projects
	Q4 2000 - Q1 2001	Receive, evaluate, and select applications for first round of financial assistance
	Q1-Q2 2002	Receive, evaluate, and select applications for second round of financial assistance
Rice Straw Business Assistance Program	Q1-Q2 2000	Develop program
	Q3 2000 - Q3 2002	Implement program
Rice Straw Financial Assistance	Q1-Q3 2000	Develop program
	Q4 2000 - Q4 2002	Implement program
Tax Credit Program	Q1-Q2 2000	Modify State Tax Credit Program

Table 6
Straw Usage Forecast
With 2003 Plan Measures
 (tons of rice straw)

Straw Usage Category		
	Low	High
Energy Alternatives		
Anaerobic Digestion	5,000	20,000
Direct Combustion for Electricity and Heat	0	20,000
Ethanol	20,000	200,000
Chemicals	0	50,000
Manufacturing/Construction		
Pulp/Paper Mills	75,000	125,000
Fiberboard	30,000	40,000
Composites/Bricks	10,000	60,000
Bale Buildings	5,000	10,000
Sound Walls	4,000	8,000
Environmental Mitigation/Compost		
Erosion Blankets	6,000	11,000
Bales and Loose Straw	10,000	15,000
Compost/Fertilizer	4,000	6,000
Livestock Utilization		
Domestic Animal Feed	100,000	200,000
Export Feed	30,000	55,000
Bedding	6,000	10,000
AVERAGE:		567,500
PERCENT OF STRAW PRODUCED		50%

Basis of Forecasted Straw Usage

It is difficult to predict whether technical and economic barriers can be overcome for these categories of rice straw usage to become operational within the next five years. The basis of the forecasted estimates used in Table 6 are discussed below for each straw usage category. The discussion focuses on the status of each usage category, including the current barriers to success. The barriers summarized here are fully described in the 1997 Alternatives Report. The basic assumption is that the measures listed at the beginning of this chapter are implemented, and that funding is appropriated by January 1, 2000.

Anaerobic Digestion

The economic feasibility of anaerobically digesting rice straw to produce methane as a fuel for generating electricity and heat requires a pilot plant demonstration. This would demonstrate whether this technology could compete with low-cost natural gas. The best market for this technology would be supplying energy to commercial rice straw conversion facilities. The waste or low-quality straw from the conversion facility could be used for the anaerobic digestion process, thus saving costs for both facilities. A one megawatt plant could use 50,000 tons of straw. Funding is needed for the pilot plant demonstration. If the pilot is successful, at least one commercial-size plant could be built by 2003, using 50,000 tons of straw. If a commercial-size plant is found not to be economically feasible, the existing pilot plant would still be able to provide energy at its existing site, using about 5,000 tons of straw annually.

Direct Combustion

There are two technical barriers to using rice straw for direct-combustion: the alkalinity of rice straw creates serious and costly slagging problems in biomass power plant boilers and the high silica content resulting in high ash creates disposal problems. An economic barrier is the low-cost, high-availability of other feedstocks, such as other agricultural byproducts and urban wastes, which can be obtained at a substantially lower cost than rice straw. A permanent subsidy may be required to make rice straw use for direct-combustion economically competitive.

Ethanol

Commercial feasibility of rice straw to ethanol conversion depends on the relatively high ethanol prices in the market. Currently, government subsidies and mandates to add oxygenated compounds to gasoline are needed to sustain the demand and price of ethanol, and the ethanol tax subsidy has recently been renewed for about 10 years. Since the western states currently import about 45 million gallons of ethanol a year, primarily from the Midwest, a rice straw ethanol plant in the Sacramento Valley could have a substantial economic advantage due to its lower transportation costs. One commercial plant could use up to 200,000 tons of straw yearly.

Industrial Chemicals

Industrial chemicals which can be produced from rice straw include diphenolic acid, succinic acid, tetrahydrofuran, silica, and citric acid. There is a large market for these chemicals, although pilot projects would need to be funded to determine the feasibility of using rice straw as the raw material. Additional funding could bring advances to this potentially lucrative usage category, since large amounts of rice straw could potentially be used in this high-value product category.

Pulp and Paper Mills

Silica sludge, a byproduct in pulping rice straw creates the main technological barrier in this potentially high-usage category. Additional research funding could overcome this barrier, after which a pilot-scale facility could be funded to demonstrate the economic feasibility of pulping rice straw. Government agencies giving preferential consideration to products made of rice straw could create their initial market demand.

Fiberboard

With a grant from the Rice Fund, FiberTech, U.S.A. is currently in the process of starting up its particle board facility expecting to achieve full scale production before the end of 1999.

Assuming product acceptance in the particle board market, additional funding could enable FiberTech to open a second facility, doubling its projected use of rice straw. Other projects are also looking for funding support to start-up operations to make medium density fiberboard and building panels.

Composites and Bricks

Rice straw can be combined with other materials to make various products such as roofing tiles and bricks. With additional funding for end-users, some of these projects could be successful in using large amounts of straw.

Bale Buildings

Most of the counties in the Sacramento Valley have issued permits for the construction of at least one rice straw bale building project. Although a standard residential home uses only about 10 tons of straw, with state and local assistance, the total amount of straw which could be used could total 5,000 to 10,000 tons annually.

Sound Walls

The California Integrated Waste Management Board (CIWMB) and CalTrans are conducting a pilot project using bales of rice straw to construct a sound wall. The sound wall will be monitored for two years. If the pilot project is successful, future sound walls, especially in and near the Sacramento Valley, could be constructed using bales of rice straw, totaling 4,000 to 8,000 tons annually.

Erosion Blankets

With a grant from the Rice Fund, Anderson Hay and Grain Inc, has started shipping rice straw to Greenfix, an Anderson-affiliated company in Brawley, to be used in making erosion control blankets. Greenfix believes substituting rice straw for its current use of wheat straw will be acceptable to its existing customers and predicts capture of an additional 10 percent of the straw market for erosion control blankets, for a total 11,000 tons straw annually.

Bales and Loose Straw

Currently about 7,500 tons of rice straw are used for erosion control in the form of bales or loose straw. If the State Tax Credit Program were modified to allow trading and marketing the tax credits, those organizations which do not have tax liabilities would have an economic incentive to

use rice straw for their erosion control needs. This could double the straw usage to 15,000 tons annually.

Compost/Fertilizer

Because of the nature of the final product, low-quality rice straw could be used for compost or fertilizer. This would create an important secondary straw market for using the straw that was unusable to make other products, thus filling a disposal need. In 1997, one company applied for a tax credit for using 1,264 tons of rice straw to produce compost and fertilizer. The State Rice Straw Tax Credit Program would need to be modified to expand this usage category.

Domestic Animal Feed

With a grant from the Rice Fund, MBI International is working on a pilot project to make a high-value animal feed for the domestic market. MBI's project includes modifying an existing small plant to produce enough of the feed for running feeding trials and to produce preliminary design specifications for a full-scale commercial plant capable of using 160,000 to 330,000 tons of straw annually. MBI did not receive the full \$1.5 dollars grant request, delaying the project by about one year. Additional funding would enhance MBI's prospect of full-scale production by 2003.

Export Animal Feed

Part of Anderson Hay and Grain's Rice Fund project is to develop the required protocols for exporting rice straw to Japan for cattle-feed. Japan currently imports rice straw from other Asian countries to meet its short-fall. Hoof-and-mouth disease in Taiwan, a large rice straw exporter to Japan, has recently created a rice straw shortage. Anderson currently exports other straws and hay to the Asian market for which it helped to develop the export protocols. The company predicts that by 2003, it can export 55,000 tons of rice straw to Japan. A two-year delay in its predicted schedule would reduce that amount to 30,000 tons.

Animal Bedding

Dairies, primarily from the San Joaquin Valley, applied for tax credits for using about 2,665 tons of rice straw for bedding material in 1997. If the Tax Credit Program were modified, it could continue to offset the transportation costs of the dairies in the San Joaquin Valley, increasing its use by more dairies. Although there are far fewer dairies in the Sacramento Valley, rice straw should be marketed to these dairies close to the rice counties since the lower transportation costs in addition to the tax credit would create a good incentive for using rice straw.

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APPENDIX A

SENATE BILL 318 TEXT

SB 318 Air pollution: rice straw burning.

BILL NUMBER: SB 318

CHAPTERED 10/07/97

BILL TEXT

CHAPTER 745

FILED WITH SECRETARY OF STATE OCTOBER 7, 1997

APPROVED BY GOVERNOR OCTOBER 7, 1997

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AMENDED IN ASSEMBLY JULY 7, 1997

AMENDED IN SENATE APRIL 3, 1997

AMENDED IN SENATE APRIL 1, 1997

INTRODUCED BY Senators Thompson and Costa

(Coauthors: Assembly Members Cardoza, Machado, Olberg,
Papan, Richter, and Woods)

FEBRUARY 11, 1997

An act to amend Sections 41865, 44535, and 44537.5 of, and to add Chapter 4.5 (commencing with Section 39750) to Part 2 of Division 26 of, the Health and Safety Code, relating to air pollution.

LEGISLATIVE COUNSEL'S DIGEST

SB 318, M. Thompson. Air pollution: rice straw burning.

(1) Existing law, the Connelly-Areias-Chandler Rice Straw Burning Reduction Act of 1991, limits the burning of rice straw in the Sacramento Valley Air Basin to prescribed percentages of the acres planted annually through 1999, and prescribes conditions and procedures for the issuance of conditional rice straw burning permits after 1999. A violation of the act is a misdemeanor.

This bill would instead specify the number of acres that may be burned in specified spring months and in specified fall months through 2000, and would revise the conditions and procedures that apply after 2000, as specified, thereby creating a state-mandated local program by changing the definition of a crime and by imposing new duties on local agencies with regard

to implementing the bill. The bill would specify related matters.

(2) The act exempts from its provisions administrative burning, as defined, that is conducted as specified.

This bill would revise the definition of administrative burning to include the burning of vegetative materials on rice research facilities authorized by the county agricultural commissioner, not to exceed 2,000 acres.

(3) The bill would require the State Air Resources Board to administer a demonstration program for the development of new rice straw technologies through the awarding of grants.

(4) Existing law establishes the California Pollution Control Financing Authority, with specified powers and duties, and specifies which projects may be considered for financing.

This bill would include projects for the disposal of agricultural waste within that provision and would make related changes.

(5) The California Constitution requires the state to reimburse local agencies and school districts for certain costs mandated by the state. Statutory provisions establish procedures for making that reimbursement.

This bill would provide that no reimbursement is required by this act for specified reasons.

SECTION 1. Chapter 4.5 (commencing with Section 39750) is added to Part 2 of Division 26 of the Health and Safety Code, to read:

CHAPTER 4.5. RICE STRAW DEMONSTRATION PROJECT

39750. The Legislature hereby finds and declares that the Connelly-Areias-Chandler Rice Straw Burning Reduction Act was enacted in 1991 to phase down rice straw burning and improve the air quality for the citizens of the state. This creates an additional significant cost to rice growers, with potential adverse impacts on the farming communities, including lost farm production; lost state, local, and federal tax revenues; lost jobs; and reduction of wildlife habitat in the rice fields. The commercial technologies that could utilize straw, making it a commodity rather than a waste disposal problem, have not developed in the rice growing areas because of the lack of marketplace risk capital to take technologies from the laboratory stage to demonstration projects. To retain the

public benefits from having a viable rice growing industry in California and to improve air quality, there is a need to provide cost-sharing grants for the development of demonstration projects for new rice straw technologies in the marketplace.

39751. The Rice Straw Demonstration Project Fund is hereby created in the State Treasury. The fund shall be administered by the state board for the purpose of developing demonstration projects for new rice straw technologies in the rice straw growing regions of California.

39752. The state board shall provide cost-sharing grants for the development of demonstration projects for new rice straw technologies according to criteria developed by the state board, in consultation with the University of California, the Trade and Commerce Agency, and the Department of Food and Agriculture, and adopted at a noticed public hearing held by the state board. The criteria shall include, but shall not be limited to, all of the following:

(a) Proposed projects shall use a technology that could use significant volumes of rice straw annually if it is commercialized, based upon such factors as potential markets and viability of the technology in meeting market demands.

(b) The state board shall provide not more than 50 percent of the cost for each demonstration project.

(c) Public and private support shall be demonstrated for proposed projects, including local community support from the rice growing community where the project would be located.

(d) The grants shall be authorized and allocated during the 1997-98 and 1998-99 fiscal years. Grants may be expended, under the grant agreement, during a period not to exceed three years from the date that the grant is awarded.

(e) Preference shall be given to projects located within the rice growing regions of the Sacramento Valley and which may be replicated throughout the region.

(f) Projects should demonstrate technical and economic feasibility.

39753. It is the intent of the Legislature that funding for purposes of this chapter be provided in the annual Budget Act. The state board may use not more than 10 percent of the rice straw technology demonstration cost-sharing funds for administrative and project review costs in carrying out the grant program.

SEC. 2. Section 41865 of the Health and Safety Code is amended to read:

41865. (a) This section shall be known, and may be cited, as the Connelly-Areias-Chandler Rice Straw Burning Reduction Act of 1991.

(b) As used in this section:

(1) "Sacramento Valley Air Basin" means the area designated by the state board pursuant to Section 39606.

(2) "Air pollution control council" means the Sacramento Valley Basinwide Air Pollution Control Council authorized pursuant to Section 40900.

(3) "Conditional rice straw burning permit" means a permit to burn granted pursuant to subdivisions (f) and (h).

(4) "Allowable acres to be burned" means the number of acres that may be burned pursuant to subdivision (c).

(5) "Department" means the Department of Food and Agriculture.

(6) "Maximum fall burn acres" means the maximum amount of rice acreage that may be burned from September 1 to December 31, inclusive, of each year.

(7) "Maximum spring burn acres" means the maximum amount of rice acreage that may be burned from January 1 to May 31 of the following year, inclusive.

(c) Notwithstanding Section 41850, rice straw burning in counties in the Sacramento Valley Air Basin shall be phased down, as follows:

(1) From 1998 to 2000, the maximum spring and fall burn acres shall be the following number of acres planted prior to September 1 of each year:

	Maximum Fall Burn	Maximum Spring Burn
Year	Acres	Acres
1998	90,000	110,000
1999	90,000	110,000
2000	90,000	110,000

(2) Notwithstanding paragraph (1), any of the 90,000 acres allocated in the fall that are not burned may be added to the maximum spring burn acres, provided that the maximum spring burn acres does not exceed 160,000 acres.

(3) Notwithstanding paragraph (1), the maximum acres burned between January 1, 1998, and August 31, 1998, shall be limited so that the total acres burned between September 1, 1997, and August 31, 1998, do not exceed 38 percent of the total acres

planted prior to September 1, 1997.

(4) In 2001 and thereafter, the maximum annual burn acres shall be the number of acres prescribed in subdivision (i), subject to subdivisions (f) and (h).

(d) The number of allowable acres to be burned each day shall be determined by the state board and the air pollution control officers in the Sacramento Valley Air Basin and equitably allocated among rice growers in accordance with the annual agricultural burning plan adopted by the air pollution control council and approved by the state board.

(e) On or before September 1, 2000, the state board, in consultation with the department and the air pollution control council, shall adopt regulations consistent with the criteria provided in subdivisions (f) and (h). On or before September 1, 1996, an advisory group shall be established by the state board and the department to assist in the adoption of those regulations.

(f) Commencing September 1, 2001, the county air pollution control officers in the Sacramento Valley Air Basin may grant conditional rice straw burning permits once the county agricultural commissioner has determined that the applicant has met the conditions specified in subdivision (h). The county agricultural commissioner shall be responsible for all field inspections associated with the issuance of conditional rice straw burning permits. A conditional rice straw burning permit shall be valid for only one burn, per field, per year.

(g) The county agricultural commissioner may charge the applicant a fee not to exceed the costs incurred by the county agricultural commissioner in making the determination specified in subdivision (f). This subdivision shall be operative only until January 1, 2009.

(h) If the terms and conditions for issuing conditional rice straw burning permits specified in paragraphs (1) to (4), inclusive, are met, a conditional rice straw burning permit may be issued unless the state board and the department have jointly determined, based upon an annual review process, that there are other economically and technically feasible alternative means of eliminating the disease that are not substantially more costly to the applicant. The terms and conditions for issuing the conditional rice straw burning permits are:

- (1) The fields to be burned are specifically described.
- (2) The applicant has not violated any provision of this section within the previous three years.
- (3) During the growing season, the county agricultural

commissioner has independently determined the significant presence of a pathogen in an amount sufficient to constitute a rice disease such as stem rot.

(4) The county agricultural commissioner makes a finding that the existence of the pathogen as identified in paragraph (3) will likely cause a significant, quantifiable reduction in yield in the field to be burned during the current or next growing season. The findings of the county agricultural commissioner shall be based on recommendations adopted by the advisory group established pursuant to subdivision (e).

(i) (1) The maximum annual number of acres burned in the Sacramento Valley Air Basin pursuant to paragraph (3) of subdivision (c) shall be the lesser of:

(A) The total of 25 percent of each individual applicant's planted acres that year.

(B) A total of 125,000 acres planted in the Sacramento Valley Air Basin.

(2) Each grower shall be eligible to burn up to 25 percent of the grower's planted acres, as determined by the air pollution control officers in the Sacramento Valley Air Basin and subject to the maximum annual number of acres burned set forth in paragraph (1), if the grower has met the criteria for a conditional rice straw burning permit.

(3) The air pollution control council shall annually determine which is the lesser of subparagraphs (A) and (B) of paragraph (1), and shall determine the maximum percentage applicable to all growers subject to the conditions set forth in subdivisions (f) and (h).

(4) A grower who owns or operates 400 acres or less who has met the criteria for the issuance of a conditional rice straw burning permit may burn his or her entire acreage once every four years, provided that the limit prescribed in paragraph (1) is not exceeded.

(5) Nothing in this subdivision shall permit an applicant to transfer, sell, or trade any permission to burn granted pursuant to this subdivision to another applicant or individual.

(j) The state board and the department shall jointly determine if the allowable acres to be burned, as provided in subdivisions (c), (f), and (h), may be exceeded due to extraordinary circumstances, such as an act of God, that have an impact over a continuing duration and make alternatives other than burning unusable.

(k) "Administrative burning" means burning of vegetative materials along roads, in ditches, and on levees adjacent to or

within a rice field, or the burning of vegetative materials on rice research facilities authorized by the county agricultural commissioner, not to exceed 2,000 acres. Administrative burning conducted in accordance with Section 41852 is not subject to this section.

(1) (1) On or before September 1, 1992, the state board and the department shall jointly establish an advisory committee composed of 10 members to assist with the identification and implementation of alternatives to rice straw burning. Members of the committee shall be from the Sacramento Valley Air Basin, and the committee shall consist of two rice growers, two representatives from the environmental community, two health officials, two county supervisors or their designees, one member from the air pollution control council, and one member from the business community with expertise in market or product development. The committee shall meet at least annually. General Fund moneys shall not be used to support the committee.

(2) The committee shall develop a list of priority goals for the development of alternative uses of rice straw for the purpose of developing feasible and cost-effective alternatives to rice straw burning. These goals shall include, but not be limited to, research on alternatives, economic incentives to encourage alternative uses, and new product development.

(m) On or before September 1, 1998, the state board, in consultation with the department, the advisory committee, and the Department of Commerce, shall develop an implementation plan and a schedule to achieve diversion of not less than 50 percent of rice straw produced toward off-field uses by 2000. Off-field uses may include, but are not limited to, the production of energy and fuels, construction materials, pulp and paper, and livestock feed.

(n) On or before September 1, 1999, the state board and the department shall jointly report to the Legislature on the progress of the phasedown of, and the identification and implementation of alternatives to, rice straw burning. This report shall include an economic and environmental assessment, the status of feasible and cost-effective alternatives to rice straw burning, recommendations from the advisory committee on the development of alternatives to rice straw burning, the status of the implementation plan and the schedule required by subdivision (m), progress toward achieving the 50 percent diversion goal, any recommended changes to this section, and other issues related to this section. The report shall be

updated biennially and transmitted to the Legislature not later than September 1 of each odd-numbered year. The state board may adjust the district burn permit fees specified in subdivision (s) to pay for the preparation of the report and its updates. The districts shall collect and remit the adjustment to the state board, which shall deposit the fees in the Motor Vehicle Account in the State Transportation Fund. It shall be the goal of the state board and the department that the cost of the report and its updates shall not exceed fifty thousand dollars (\$50,000).

(o) The state board and the California Department of Food and Agriculture shall jointly collect and analyze all available data relevant to the air quality and public health impacts and, to the extent feasible, the economic impacts, that may be associated with the burning of rice straw pursuant to the schedule provided in subparagraph (1) of subdivision (c). On or before July 1, 2001, the state board shall submit a report to the Legislature presenting its findings regarding the air quality, public health, and economic impacts associated with the burning of rice straw pursuant to the schedule provided in paragraph (1) of subdivision (c).

(p) The Legislature hereby finds and declares as follows:

(1) Because of the requirements imposed by this section, rice straw that was previously burned may present, as solid waste, a new disposal problem.

(2) The state should assist local governments and growers in diverting rice straw from landfills by researching and developing diversion options.

(q) It is the intent of the Legislature that all feasible alternatives to rice straw burning and options for diverting rice straw from landfills be encouraged.

(r) This subdivision confirms that reductions in emissions from rice straw burning qualify for air quality offsets, in accordance with paragraphs (1) and (2).

(1) These credits shall meet the requirements specified in state law and district rules and regulations, and shall comply with applicable district banking rules established pursuant to Sections 40709 to 40713, inclusive. Districts are urged to establish banking systems in accordance with Sections 40709 to 40713, inclusive. The state board may adopt regulations to implement this subdivision, including, but not limited to, consideration of the seasonal and intermittent nature of rice straw burning emissions. In developing the regulations, the state board shall consult with all concerned parties. However,

emission reduction credits that would otherwise accrue from reductions in emissions from rice straw burning shall not be affected or negated by the phasedown of burning, as specified in subdivision (c).

(2) Reductions in emissions achieved in compliance with subdivision (c) that are banked or used as credits shall not be credited for purposes of attainment planning and progress towards the attainment of any state or national ambient air quality standard as required by state and federal law.

(s) (1) Any person who negligently or intentionally violates any provision of this article is guilty of a misdemeanor and is subject to a fine of not more than ten thousand dollars (\$10,000), imprisonment in the county jail for not more than nine months, or by both that fine and imprisonment. This subdivision applies only to agricultural burning in the Sacramento Valley Air Basin.

(2) Any person who negligently or intentionally violates any provision in this article is liable for a civil penalty of not more than ten thousand dollars (\$10,000). This subdivision applies only to agricultural burning in the Sacramento Valley Air Basin.

(t) Districts in the Sacramento Valley Air Basin shall impose fees on growers to cover the cost of implementing this section pursuant to Section 42311.

(u) To the extent that resources are available, the state board and the agencies with jurisdiction over air quality within the Sacramento Valley Air Basin shall do both of the following:

(1) Improve responses to citizen complaints, and, to the extent feasible, immediately investigate and analyze smoke complaints from the public to identify factors that contribute to complaints and to develop better smoke control measures to be included in the agricultural burning plan, keep a record of all complaints, coordinate among other agencies on citizens' complaints, and investigate the source of the pollution causing the complaint.

(2) Respond more quickly to requests for update from county air pollution control officers to help maximize burning days when meteorological conditions are best suited for smoke dispersion.

SEC. 3. Section 44535 of the Health and Safety Code is amended to read:

44535. (a) The authority may separately approve financing for projects, the purpose of which is to prevent or reduce

environmental pollution resulting from the disposal of solid or liquid waste.

(b) The following projects shall be considered for financing:

(1) Projects utilizing recognized resource recovery or energy conversion processes.

(2) Projects utilizing new technologies or processes for resource recovery or energy conversion.

(3) Projects utilizing technologies designed to reduce the level of pollutants found in water.

(4) Recycled water facilities.

(5) Water main replacements.

(6) Water filtration facilities.

(7) Projects for the disposal of agricultural wastes.

(8) Other projects for the reduction of environmental pollution resulting from the disposal of solid or liquid waste.

(c) The projects specified in subdivision (b) may include elements that provide for new refuse removal vehicles, transfer stations, resource recovery or energy conversion plants, source separation, or any solid or liquid waste disposal facilities involved in resource recovery systems. "Solid or liquid waste disposal facilities" means any property, or portion thereof, used for the collection, storage, treatment, utilization, processing, or final disposal of solid or liquid waste in resource recovery systems.

SEC. 4. Section 44537.5 of the Health and Safety Code is amended to read:

44537.5. The authority shall provide the maximum opportunity for the use of the authority's financing by individuals, businesses engaged in agricultural operations, and small businesses or corporations by providing information, assistance, and coordination to facilitate financing for small projects and other financing that benefits the environment, including financing for projects for the disposal of agricultural wastes, with special attention to the needs of businesses that do not meet standard commercial lending requirements but provide public benefits, such as job creation or retention.

SEC. 5. No reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution for certain costs that will be incurred by a local agency or school district because this act creates a new crime or infraction, eliminates a crime or infraction, or changes the penalty for a crime or infraction, within the meaning of Section 17556 of the

Government Code, or changes the definition of a crime within the meaning of Section 6 of Article XIII B of the California Constitution.

Moreover, no reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution for certain other costs that will be incurred because a local agency or school district has the authority to levy service charges, fees, or assessments sufficient to pay for the program or level of service mandated by this act, within the meaning of Section 17556 of the Government Code.

Notwithstanding Section 17580 of the Government Code, unless otherwise specified, the provisions of this act shall become operative on the same date that the act takes effect pursuant to the California Constitution.

Searching keywords: (statusch) (authorThompson) (HooS)

APPENDIX B

**REPORT TO THE LEGISLATURE
RICE STRAW UTILIZATION TAX CREDIT PROGRAM**

Report to the Legislature
Rice Straw Utilization Tax Credit Program
California Department of Food and Agriculture
June 1, 1998

The Rice Straw Utilization Tax Credit Program was established by SB 38 (Lockyer, Ch 954, 1996) as Section 17052.10 of the State Revenue and Taxation Code. The law provides that for each taxable year beginning on or after January 1, 1997, and before January 1, 2008, there shall be allowed as a credit against the amount of "net tax," as defined (California state income tax), the amount of \$15 per ton of rice straw that is grown within California and purchased during the taxable year by the taxpayer. The taxpayer must be the "end user" of the rice straw, meaning anyone who uses the rice straw for any purpose, including but not limited to processing, generation of energy, manufacturing, export, or prevention of erosion, exclusive of open burning, that consumes the rice straw. The taxpayer cannot be related, under the Internal Revenue Code to any person who grew the rice straw within California. The law limits the aggregate amount of the tax credit to \$400,000 for each calendar year. In cases where the tax credit exceeds the "net tax," the excess may be carried over to reduce the "net tax" for the next ten taxable years, or until the credit has been exhausted, which ever comes first.

Under the law, the California Department of Food and Agriculture (CDFA) must:

- certify that a taxpayer has purchased rice straw during the specified taxable year,
- issue certificates to qualified taxpayers on a first-come, first-served basis,
- provide an annual listing to the Franchise Tax Board,
- provide the taxpayer with a copy of the certification,
- obtain the taxpayer's identification number, and
- provide an annual informational report to the Legislature.

Background:

The Connelly-Areias-Chandler Rice Straw Burning Reduction Act of 1991 (AB 1378, Ch 787, 1991) mandated the phase down of open field rice straw burning by 1998. The phase down period was recently extended until 2000 (Thompson, SB 318, Ch 745, 1996) due in part to the recognition that alternative straw management options were costly and slow to develop. Furthermore, soil incorporation of straw, the only widely available management option, continues to cause adverse effects to rice farming operations including but not limited to increased costs, increased incidence of disease and weeds, and other land and irrigation management problems.

The Legislature, recognizing the need for incentives to speed the development of off-field uses of rice straw, established the tax credit as one incentive. The \$400,000 annual tax credit represents 26,667 tons of rice straw, or about 9,000 to 13,000 acres. Last year, about 485,000 acres of rice was planted in the Sacramento Valley.

Program Status:

Last year, 1997, was the first year of the program. Nearly one hundred fifty telephone, written and faxed inquiries were received and responded to by the Department. Applications for the tax credit were accepted on a first-come, first-served basis starting on September 2, 1997 at 8:00 am at the CDFA headquarters in Sacramento. To date 35 applications have been received, requesting \$468,459 in tax credits for purchase of 31,230.6 tons of rice straw. CDFA approved 28 applications totaling \$90,506 in tax credits for purchase of 6,033.7 tons of rice straw. Please see Table 1.

Table 1: Program Summary

Requests	Number	Tons	Tax Credit (\$)
Total	35	31,230.6	\$468,459
Certificates Issued	28	6,033.7	\$ 90,506
Denied	7	25,196.9	\$377,953

Of the seven applications denied, four did not adequately document purchase, while three purchased straw in other years, but did not purchase the straw in 1997. Those that documented purchases in 1998 will be able to apply for the tax credit under the program next year, if they so chose. Several of these applications were from companies anticipating start up of new straw processing facilities that did not materialize. As such, they did not exercise their intent to purchase rice straw, and thus did not in fact purchase rice straw. Thus, they did not qualify for the tax credit and their applications were denied. Three of these applications represented 25,000 tons of rice straw.

Of the 27 applications approved, 18 were dairies, four were manufacturing companies, three were other livestock operations, two were private home builders, and one was a landscaping contractor. The primary uses of the rice straw were for animal bedding, animal feed, erosion control, straw bale construction, and compost/fertilizer manufacturing. Please see Table 2 and Table 3.

Table 2: Types of Businesses

Business	Number	Tons	Tax Credit (\$)
Dairy	19	3,336.6	\$50,049.00
Cattle	3	939.9	\$14,098.50
Landscape Contractor	1	49	\$ 735.00
Compost/Fertilizer Mfg.	1	1,263.7	\$18,955.50
Feed Manufacturer	1	336.3	\$5,044.50
Erosion Control Mfg.	1	58.5	\$ 877.50
Owner/builder	2	49.7	\$ 745.50
TOTAL	28	6,033.7	\$90,506

Table 3: Methods of Use

Method	Number*	Tons*
Animal bedding	18	2966.7
Feed	6	2,501.5
Compost/fertilizer	1	1,263.7
Building construction (bales)	2	49.7
Erosion control	3	460.2
TOTAL	30	7,241.8

*Two certified applicants used the straw for multiple purposes (feed/bedding, and erosion control/bedding). Thus, 1,208.1 tons of straw is double counted.

The Department has prepared an annual listing of the qualified taxpayers who were issued certificates and the amount of rice straw purchased by each taxpayer and provided it to the Franchise Tax Board on computer readable form and in the manner prescribed by the Board.

The Department will announce the 1998 Rice Straw Utilization Tax Credit Program in August, 1998, before rice harvest begins. The Department anticipates accepting applications for the 1998 tax credit on a first-come, first-served basis in late November or early December, 1998.

Conclusions and Recommendations:

Industry experts and the University of California, Department of Agricultural and Biological Engineering estimate that no more than 40,000 tons of rice straw were harvested in 1997. Most probably, that figure does not exceed 20,000 tons. Thus, about 30% of the harvested rice straw was purchased under the tax credit. Currently the potential for harvesting rice straw is limited by equipment availability and, during this past year, weather.

Although the rice straw utilization tax credit is limited in scope compared to the available resource, it is not yet limited when compared to the current market for the resource or the ability to harvest the resource. There is no existing large market for rice straw that can take full advantage of the tax credit. The dairy industry seems to be in the best position to claim the tax credit. In this situation, the tax credit serves to offset the transportation costs associated with hauling the straw from the Sacramento Valley rice production region to dairies in the San Joaquin Valley. It is anticipated that many more dairy operators will take advantage of the tax credit in the coming years.

A successful startup of a commercial straw processing facility could change the dynamics of the program drastically. Any such facility that processes straw to straw board, fiber board, feed, ethanol fuel, electricity, erosion control materials, pulp or paper, or other products at a commercial scale would easily consume the amount of straw each year that would be eligible for the tax credit. At this point in the development of these projects, project financing and straw

handling infrastructure and logistics are more formidable barriers than the cost of rice straw. This is not to say that rice straw costs, and thus, the incentive provided by the tax credit is not important. An assured reduction in the straw acquisition cost that can be provided by the tax credit, can make some straw processing projects more attractive to potential investors.

As demand for the tax credit increases, and economic and environmental benefits of off-field rice straw utilization are documented, the Legislature may want to consider expanding the program by lifting the annual \$400,000 cap in order to attract larger and more diverse projects.

The CDFA has also received comments concerning the equity of the "first-come, first-served" provision, since conceivably, one entity could use the entire credit. Some have suggested that a cap of \$1,000 to \$4,000 be established for individual applications.

If the tax credit provides little incentive to new, startup processing facilities, the Legislature may want to consider a tax credit purchase or trading program that would allow new straw utilization projects with little or no California income tax liability to sell their tax credits to a profitable entity that could take advantage of the tax credit. The CDFA has received several inquiries and suggestions in this regard.

Several members of the rice industry have suggested that the unused tax credit from each year be dedicated to other activities that support off-field utilization of rice straw. Such activities may include but not be limited to development of rice straw harvest and storage infrastructure, market development and expansion for rice straw based products, and support for those potential utilization technologies not supported through other programs.

Attachment:
1997 Summary Table

1997 Summary
Rice Straw Utilization Tax Credit Program
California Department of Food and Agriculture

Type of Business	Use	Tons	\$ Credit \$
Dairy	Animal Bedding	87	\$1,305.00
Dairy	Animal Bedding	19.27	\$289.05
Dairy	Animal Bedding	15.1	226.5
Owner/Builder	Building Construction	4	\$60.00
Cattle	Livestock Feed	9	\$135.00
Dairy	Animal Bedding	199.75	\$2,996.25
Hydroseeding Contractor	Erosion Control	49	\$735.00
Dairy	Animal Bedding	159.11	\$2,386.65
Dairy	Animal Bedding	65.04	\$975.60
Manufacturer	Compost/Fertilizer	1,263.75	\$18,956.25
Dairy	Animal Bedding	159.82	\$2,397.30
Dairy	Animal Bedding	300	\$4,500.00
Dairy	Animal Bedding	181.615	\$2,724.23
Dairy	Animal Bedding Livestock Feed	855.18	\$12,827.70
Manufacturer	Erosion Control Blankets	58.48	\$877.20
Owner/Builder	Building Construction	45.7	\$685.50
Dairy	Animal Bedding	43.34	\$650.10
Dairy	Animal Bedding	43.02	\$645.30
Dairy	Livestock Feed	25.87	\$388.05
Dairy	Animal Bedding Erosion Control	352.74	\$5,291.10
Manufacturer	Livestock Feed	336.285	\$5,044.28
Dairy	Animal Bedding	40.075	\$601.13
Dairy	Animal Bedding	79.28	\$1,189.20
Dairy	Animal Bedding	119.79	\$1,796.85
Dairy	Animal Bedding	200	\$3,000.00
Dairy	Animal Bedding	46.54	\$698.10
Dairy	Livestock Feed	370	\$5,550.00
Cattle	Livestock Feed	905.2	\$13,578.00
TOTAL		6,033.955	\$90,509.34

APPENDIX C

**RICE FUND PROPOSED GRANT AWARDS
FOR FISCAL YEAR 1997-98**

**THE RICE STRAW
DEMONSTRATION PROJECT FUND**

**Proposed Grant Awards
For Fiscal Year 1997-98**

Presented for the California Air Resources Board's Consideration
May 21, 1998

Introduction

Senate Bill 318 (1997, Thompson) created the Rice Straw Demonstration Project Fund (the Rice Fund) and directed the California Air Resources Board to administer it. The goal of the Rice Fund is to help create a market for Sacramento Valley rice straw by providing cost-sharing grants for projects which show the greatest potentials for becoming commercially self-sustaining users of rice straw.

Twelve grant requests were received for fiscal year 1997-98 funding. Grant requests were evaluated by expert reviewers using the funding criteria (see page 2) adopted by the Board at its January 29, 1998, public meeting. The review panel consisted of four business experts, three technology experts, and three rice straw experts.

Based on the results of the review process, staff is recommending to the Board that the following three projects be awarded grants:

"Preprocessing of Rice Straw for Multiple Products" by Anderson Hay & Grain Co., Inc. for \$500,000;

"Bioboard Plant for Colusa, California" by FiberTech USA, Inc. for \$750,000;

"Production of Fermented Animal Feeds from Sacramento Valley Rice Straw: Prototype and Commercial Pilot" by MBI International for \$820,000.

Brief project descriptions and evaluation summaries are presented for these three projects.

For fiscal year 1997-98, \$2.5 million was appropriated to the Rice Fund. The law specifies that this amount be reduced by the total amount that state agencies other than the State Air Resources Board expend for research, development, or demonstration projects on alternative uses of rice straw during the 1997-98 fiscal year. The Director of Finance determined that this fiscal year's funding be reduced by \$200,000 due to the California Energy Commission's expenditure for the Energy Efficient Rice Straw Disposal Demonstration Program. After deducting this \$200,000 plus \$230,000 for administrative costs, \$2.07 million remains available for grant awards. This is the total amount being recommended for this fiscal year's grants.

Funding Criteria Used to Evaluate Rice Fund Grant Requests

Grant requests were evaluated using the criteria given below, which were adopted by the Air Resources Board at its January 29, 1998, public meeting.

Technical Plan Review:

- Viable technology for utilization of rice straw
- Reasonable and complete project
- Stage of technology development
- Technical competency of project team

Business Plan Review:

- Business merit and commercialization plan
- Straw supply plan
- Financial support and credit integrity
- Business competency of project team

Program Goals Satisfaction:

- Potential quantity of rice straw to be used annually
- Length of time to self-sustaining operation
- Project location and replication potential
- Local community support

Policy Assessment:

- Policy Assessment
- Environmental Effects

Title: *“Preprocessing of Rice Straw for Multiple Products”*

Applicant: Anderson Hay & Grain Co., Inc.

Grant Amount: \$500,000

Straw used after 5 years: 205,000 tons per year

Project time: 3 years

Background

In recent years, only about 8,800 tons of rice straw per year have been used off-field. If the goal of the Rice Fund, which is to help create a market for straw, is realized, vast quantities of straw will need to be handled, that is, harvested during a short time, baled, transported, and stored. For these reasons, the Rice Fund Program Description and Invitation for Grant Requests specified that straw handling projects were being sought.

Proposal Summary

Anderson Hay & Grain proposes to develop the infrastructure necessary for handling vast quantities of rice straw by using their extensive experience in establishing such an infrastructure for grass straw in Oregon. Anderson also proposes to use rice straw to make erosion control blankets; to develop business and fumigation protocols to export rice straw for use as livestock feed in Asia; to develop the preprocessing methodologies to prepare rice straw for paper and board applications; and to identify potentially large-scale users of rice straw based on the premise that preprocessed straw would be more efficient to use for commercial-scale applications. Anderson's executive summary of its proposed project is on page 4.

Evaluation Summary

Reviewers noted the Anderson project team's excellent technical and business competency and directly related experience with similar projects using various kinds of grasses. Anderson was judged to have the soundest financial capability and integrity and extensive business and technical experience in all project areas.

Besides taking responsibility for developing the much needed straw infrastructure, this project will seek to export large quantities of rice straw to Asian countries as cattle feed. Anderson currently exports other straws to Asia and is in a good position to develop the needed protocols for opening up vast markets for rice straw in Asia.

The Anderson team has stated that they would work with Sacramento Valley rice growers to make their project a mutually beneficial enterprise. Anderson is a well-established and well-funded company with an established track record. Anderson plans to commit \$750,000 to the project. Staff recommends that Anderson be awarded a grant of \$500,000.

Preprocessing of Rice Straw for Multiple Products Project

EXECUTIVE SUMMARY

Provided by Anderson Hay & Grain Co., Inc

Anderson Hay & Grain Co., Inc has made a good-faith effort to develop the following Rice Straw Demonstration Project Fund Grant Request within the short time period provided for applicants to develop projects. Anderson Hay & Grain Co., Inc. believes that its management team, and the Project Team assembled for this Project, have the capabilities to accomplish what has been set out in the following Grant Request. However, Anderson Hay & Grain Co., Inc. hopes that the California Air Resources Board, and its Technical Support Division staff, realize that any number of things completely beyond the control of Anderson Hay & Grain Co., Inc. may materially affect Anderson's ability to meet its goals in one or more of the following endeavors.

The Applicant for the Preprocessing of Rice Straw for Multiple Products Project is Anderson Hay & Grain Co., Inc. of Ellensburg, Washington. The Project seeks to determine if by preprocessing Sacramento Valley rice straw, can sufficient value be added to make it attractive for multiple products produced by commercial scale end users. The Project Objectives are 1) to determine if the necessary infrastructure can be developed to gather, bale, handle, transport and store significant quantities of the rice straw; 2) to run a series of tests to determine if rice straw can be preprocessed into a form more suitable for domestic and world feed markets, and more readily usable by multiple commercial scale end users; this second phase will determine if adding value through preprocessing the rice straw helps to create multiple uses on a commercial scale, especially if the straw can be preprocessed to predetermined specifications set by an end user; and 3) the Project will identify potential large scale users of rice straw based on the premise that since the straw has been converted into a more usable form, it will be easier and more efficient to use for commercial scale applications. The Applicant and its partners have conducted previous work in all three areas. The implementation of the Project could create as many as 175 full-time jobs and 183 seasonal jobs in the Sacramento Valley. By the end of the three years during the Rice Fund grant proposal funding period, the Project could use 8,000 tons of rice straw on an annual basis; three years after the end of the Rice Fund grant proposal funding period, up to 221,000 tons of rice straw could be used.

Anderson Hay & Grain Co., Inc. is requesting \$500,000 in matching funds from monies appropriated to the 1998 Rice Straw Demonstration Project Fund despite the total estimated amount of Project investment required of the Preprocessing of Rice Straw for Multiple Products Project if all products are developed in the manner set out in this proposal. Anderson is willing to invest up to \$750,000 to determine if the Project is feasible. Anderson has made a good-faith effort to develop the following estimated total Project Budget within the short time period provided for applicants to develop projects. Anderson intends to lease the majority of the assets shown in the following Project Budgets. However if Anderson were to build and/or develop all of the necessary Project facilities the total estimated Project Budget for all facilities is an estimated \$42.5 million. **Anderson is not making a commitment to expend \$42.5 million in exchange**

for a \$500,000 grant from the Rice Fund In addition, the estimated annual operating budget for each year is included. The annual operating budget assumes the fixed assets are leased by Anderson. (These Project Budget figures were developed primarily as a result of work completed on a confidential client's related project.)

Title: "Bioboard Plant for Colusa, California "

Applicant: FiberTech

Grant Amount: \$750,000

Straw used after 5 years: 125,000 to 200,000 tons per year Project time: 9 months

Proposal Summary

FiberTech plans to install a manufacturing line to make particle board out of rice straw. The *Bioboard* would be used in the same applications as wood-based particle board, but FiberTech plans to target niche markets. FiberTech already has a 14,000 square foot facility and eight acres of straw storage in the Colusa Industrial Park. FiberTech plans to be in production during the 4th quarter of 1998 and expects to be commercially viable within six months after start-up. This first facility is projected to use between 25,000 and 40,000 tons of rice straw annually; several more facilities are planned in the future. FiberTech's executive summary of its proposed project is on page 7.

Evaluation Summary

This project has the potential to use significant amounts of rice straw in the near-term (in approximately nine months). The product's mainstream appearance and similarity to wood-based particle board with widely accepted applications should make it easier for FiberTech to enter this large market. The marketing strategy of focusing on customized services and niche markets appears sound.

FiberTech has already made significant investments of time and money into the project. Subject to FiberTech's receipt of this Rice Fund grant, outside investment sources would fill FiberTech's remaining start-up capital needs. The grant would trigger the purchase of the needed manufacturing equipment and the hiring of the manufacturing plant manager considered critical to the success of the project. FiberTech has also already demonstrated its ability to procure, store, and handle significant quantities of straw. It has strong community support.

FiberTech plans to commit its existing facility and \$839,000 in corporate and borrowed funds. Staff recommends that FiberTech be awarded a grant of \$750,000.

Bioboard Plant for Colusa, CA

EXECUTIVE SUMMARY
Provided by FiberTech USA, Inc.

FiberTech USA, Inc. is an applicant for funds from the Air Resources Board's Rice Straw Demonstration Project Fund. FiberTech plans to install a manufacturing line in its facility in Colusa, CA to make particleboard out of rice straw.

FiberTech USA, Inc. has been active in the Sacramento Valley since 1995. It presently has a facility in Colusa, California in which it plans to produce Bioboard . Bioboard is a rice straw particleboard which will be used in the same applications as wood-based particleboard. Bioboard should be equivalent or superior in performance compared to wood-based particleboard.

FiberTech estimates that the project will take 9 months to be commercially self-sustaining. The company plans to be in production during the 4th quarter of 1998. FiberTech plans to be commercially viable roughly within 6 months after start up.

FiberTech's facility is located in the Colusa Industrial Park in Colusa, California. The site includes space for the manufacturing facility and for the storage of rice straw. The manufacturing facility is over 14,000 sq. ft. including offices. There are roughly 8 acres of all weather access storage area for rice straw with room for more. Once in operation, this facility will create between 14 and 20 full time jobs. This facility alone can use between 25,000 and 40,000 tons of rice straw annually.

According to the guidelines of the application, the projected project costs over the 9 months of grant disbursement FiberTech is requesting should be \$1,588,740. FiberTech is requesting a grant of \$750,000. Much of this money will be used to collect and store rice straw at its facility. The rice straw will be collected during the fall of 1998.

Title: *“Production of Fermented Animal Feeds from Sacramento Valley Rice Straw: Prototype and Commercial Pilot”*

Applicant: MBI International

Grant Amount: \$820,000

Straw used after 5 years: 165,000 to 330,000 tons per year Project time: 1 year

Commercialization: 2002-2003

Applicant Background

MBI is a non-profit, technology and business development company focusing on creating industrial products from agricultural resources. MBI was formed in 1981 as the Molecular Biology Institute at the recommendation of Michigan’s Task Force on High Technology. It has an established track record in not only research and development, but in the management of business commercialization through its for-profit subsidiary, Grand River Technologies, Inc.

Proposal Summary

MBI proposes to process rice straw into a high-value animal feed for domestic dairy and beef cattle. The new feed is expected to provide 90-95 percent of the energy value of feed corn at 50-70 percent of the cost of similar feeds that are now on the market. MBI’s technology is based upon MBI’s proprietary Ammonia Fiber Explosion (AFEX) and fermentation technologies. The value added to the rice straw as a result of the processing MBI proposes includes enhanced digestibility and added food value. MBI proposes to build a mobile pilot plant, optimize the straw conversion process, perform live animal feeding trials, and produce the engineering plans for the first full-scale production facility. If commercial operation is feasible, MBI proposes that several plants be established which would consume up to 330,000 tons of straw per year. MBI’s executive summary of its proposed project is on page 10.

Evaluation Summary

MBI has demonstrated significant commitment to see the project through to the development of a full-scale production facility. The project team has strong technology credentials, and the proposal demonstrated a good understanding of the technical gaps that need to be bridged for the project to succeed. The product will be priced low enough to allow easy entry into a market that currently relies heavily on out-of-state imports.

Financial support of this project is also being provided by the U. S. Department of Agriculture (USDA), the U. S. Environmental Protection Agency, and the U. S. Department of Energy. For the feeding trials, MBI has enlisted the collaboration of the following: Agricultural Research Service of the USDA; Michigan State University, Department of Chemical Engineering; Texas A & M University, Department of Animal Science; University of California, Davis, California Institute of Food and Agricultural Research; and Harris Ranch Beef Company in Selma, California.

MBI's grant request was for \$1.5 million. Staff recommends reduced funding at \$820,000, for which the applicant has rescoped the project plan. MBI plans to commit \$328,000 of its own money for this project. If this project succeeds in its goals, considerable quantities of rice straw would be used.

*Production of Fermented Animal Feeds From Sacramento Valley Rice Straw:
Prototype and Commercial Pilot, MBI International, Lansing, Michigan*

**EXECUTIVE SUMMARY
Provided by MBI International**

MBI International (MBI) is working to commercialize the production of a new value-added animal feed for ruminants based upon lignocellulosic material such as Sacramento Valley rice straw. The new feed will provide 90-95% of the energy value of feed corn at roughly 50-70% of the cost. MBI's technology is based upon the proprietary Ammonia Fiber Explosion (AFEX) technology and the proprietary fermentation technology of MBI. This technology is based upon the treatment of lignocellulosic material with liquid ammonia followed by an instantaneous decompression to atmospheric pressure to produce a highly digestible material. This material is then fermented into an animal feed product with the characteristics of other commonly used ruminant feeds and supplements. MBI has expended considerable time and resources to bring this technology to its current point. We are now ready to move forward with a commercial pilot that will prepare us for the first commercial plant in 2002-2003. The first commercial plant is expected to handle 500-1000 dry tons/day, and will operate 330 days per year (165,000-330,000 tons/year). One 500-ton/day plant is expected to create approximately 45 new jobs (direct and indirect). The total cost of the first commercial plant is estimated at \$25-35 million. Once the first plant comes on line, additional plants will be constructed and brought on line as demand requires. Under the current RFP, MBI requests \$1.5 million in funding from the State of California to be matched by an additional \$1.5 million in other funding from MBI and other sources for a total project cost of \$3 million.

MBI International proposes a comprehensive, goal-oriented program to construct the first commercial plant to produce high quality ruminant feed from Sacramento Valley rice straw. The proposed project will run from June 1998 - May 1999 and will be accomplished in four primary tasks. First, the project will result in a pilot for the production of a rice straw-based ruminant feed to be located in the Sacramento Valley. Process optimizations will occur at this site and at MBI's facility in Lansing, MI. We are currently discussing possible pilot and production sites with UC-Davis, Colusa and Sutter counties. Second, the feed produced will be tested in live animal feeding trials at the Harris Ranch, UC-Davis, and the USDA National Dairy Forage Laboratory to prove the viability of the feed for both beef and dairy cattle production. Third, the project will produce the preliminary engineering data and drawings required for the first commercial production facility. This work will occur at MBI's facility in Lansing, MI. Fourth, the preliminary site selection will be completed for the first full-scale commercial plant. MBI has assembled a team that possesses the expertise required to complete the commercial requirements by 2002-2003. In the remainder of this proposal, we present the technical introduction necessary to understand the problem, expected benefits, outline of our plan, key personnel, and anticipated level of effort for the proposed program.