

THE BRAWLEY CALIFORNIA HEMP RESEARCH PROJECT OF 1994



Photo courtesy of Transylvania University, KY.

Directed and funded by Hemp Biotech a division of the Hempstead Company of CA.

" Healthier living through Hemp industries..."

Research of True Hemp (Cannabis Sativa L.). for Agronomic crop feasibility in California

The physical growth of True Hemp (cannabis sativa L.) with combined effects of, above average atmosphere below sea level and soil temperature, conducted at the Irrigated Desert Research Station at Brawley, California by Hemp-Biotech, a division of the Hempstead Company of Costa Mesa, California. Lead Project Coordinator, Christopher J. Boucher, Field Technician, David T. Martyn Jr., Edited by Stephen H. Saunders.

This is the first corporate sponsored industrial hemp research project since 1957. Since hemp is defined in the USDA(Farmer's Bulletin 1935.) as a strategic crop. According to the state of California however, the legality of True Hemp is in question since Hemp (Cannabis Sativa L.) is not recognized as a legal or viable crop for research or economic enhancement for California's rural communities.

The mission of this project was to increase the long term viability and competitiveness of food and fiber production and expand economic opportunities in rural America and enhance the quality of life for farmers, rural citizens and society as a whole. Further, to develop information and systems to enhance the environment and the material resource base upon which a sustainable agricultural economy depends, and at a time when the attrition rate of farm-based industry is at an all-time high.

We believe it is of utmost importance for the public to know the true agronomical statistics and facts about True hemp (cannabis sativa L.).

After five months of research, the State of California stepped in and destroyed the fields of hemp, interrupting this historical agricultural project on July 29th of 1994.

Included here is the growing and testing data from this project. It is our intention to complete this report with a harvested and processed crop, and without interruptions, at a future date.

3.12.94 Through 7.25.94

PHYSICAL FIELD AND PROCEDURE DATA

The data was compiled from growth reports on stem length and width, analytical contents of cellulose and hemicellulose weights, lignin contents, and pectin concentrates. Seed oil proteins were weighed and tested. Secondary fiber and inner core weights were measured and total plant weights were tested and weighed. (roots were removed at the base of the stem.)

All procedures were conducted according to "FORAGE Fiber ANALYSES ", U.S.D.A., jacket 387-598; HANDBOOK NO. 379.

Four varieties were planted. The soil was Imperial silty clay loam. The acreage was divided into 5 plots and 2 flat beds. The soil was disked 3 times and floated. There were 3 rows per bed, spaced 1' between rows. #6 Kenaf.

Table 1. Topography of hemp plots

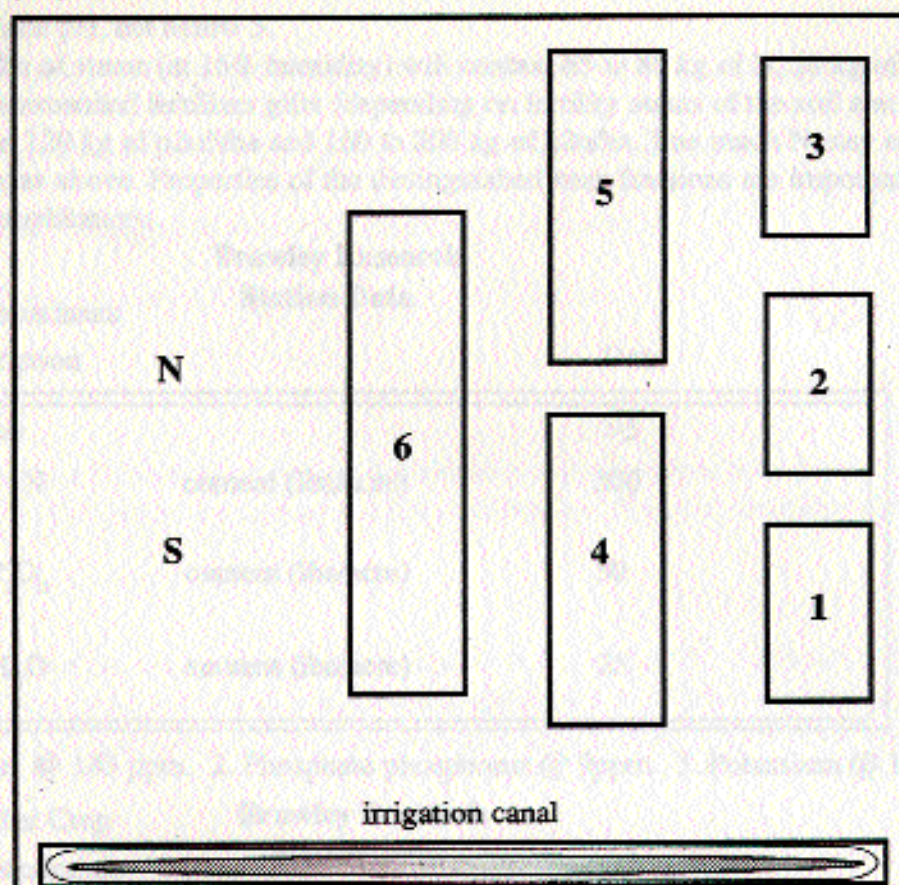


Table 2. Dimensions and variety

Bed#	Variety	Bed Size	Desired crop
1	Uniko-B unisex f	18' x 140' flat; disked 3x float & plane	(fiber crop)
2	Kompolti hybrid TC	18' x 137' flat; disked 3x float & plane	(fiber crop)
3	Futura 77	20' x 287' row 6" rows 1' wide	(fiber crop)
4	Uniko-B	20' x 300' 6" rows 1' wide	(seed crop)
5	Futura 77	20' x 300' 6" rows 1' wide	(seed crop)
6	Kenaf field	3' 4" center on beds	

Table 3. Data Comparisons from Existing Hemp Studies

Indicated in report of a visit to the Federation Nationale Des Producteurs de Chanvre at Le Mans, France.

Soil test should include pH. not below 5.

A crop yielding 8 t/ha of stems (at 16% humidity) will contain 65 to 80 kg of N, 20 kg of p_2O_5 and 120 kg of k_2O . Recommended fertilizer gifts (depending on fertility status of the soil are: 100 to 140kg of N/ha, 80 to 120 kg of p_2O_5 /ha and 160 to 200 kg of k_2O /ha. Too much N may cause lodging. Same study as above. Properties of the distinguished stem fractions are important for potential industrial applications.

Soil Comparisons		Brawley Research Station Data	
Description			Data
*ph			>5
N	content (lbs/acre)		300
* P_2O_5	content (lbs/acre)		50
* K_2O	content (lbs/acre)		25

1. Nitrate Nitrogen @ 143 ppm. 2. Phosphate phosphorus @ 9ppm. 3. Potassium @ 180 ppm.

Fiber Crop		Brawley Research Station Data	
Description			Data
seeds (#/ft ²)			100
resulting normal plants			18-25
** desirable yield			
plants(#/ft ²)			18-48
yield in stems (tons/acre)			6-8
yield in grain (lbs/acre)			3300-5500
yield in bark content (%)			30-40

Seed Crop		Brawley Research Station Data	
Description			Data
density (plants/yd ²)			17-24
** desirable seed yield			

SEED DATA

As received from overseas, ECC approved seeds. These are some of our seed measurements & weights:

- 1) Uniko-B unisex female seed variety 3.72 gms./ 200 seeds or 118k seeds/ lb.
- 2) Kompolti Hybrid TC variety 4.34 gms. / 200 seeds or 101k seeds/ lb.
- 3) Fedrina Futura 77 seed variety 3.32 gms./ 200 seeds or 133k seeds/ lb

Futura 77 is a monoecious French fiber cultivar cultivated mainly for paper pulp production. Kompolti & Uniko-B Hungarian are mainly for fiber cultivation. They are dioecious species.

Growth and condition of the hemp using cv Kompolti Hybrids, Unico TC, Cultivars and Futura 77, all of which are of Northern Latitude descent adapted extremely well. Showing subtlety for hot desert climates, plus soil temperature, plus carbon dioxide levels, along with weekly watering, using gravity flow.

Table 4. Cultivars composite

collection #	Origin	THC	CBD	Ratio
881343	Kompolti/Hungary	0.55	0.79	0.71
881347	Kompolti/Hungary	0.63	1.01	0.62
883048	Kompolti/Hungary	0.10	1.52	0.07
883049	Kompolti/Hungary	0.25	1.08	0.23
891069	Kompolti/Hungary	0.15	1.39	0.11
891071	Kompolti/Hungary	0.69	0.93	0.74
880822	Futura 77/France	0.11	0.21	0.12
883066	Futura 77/France	0.32	1.77	0.18
883045	Unico B/Hungary	0.35	0.97	0.38
891070	Unico B/Hungary	0.22	1.21	0.18

Hybrid 883154 x 883049

Results of character of Cannabis accessions study indicate fiber maturity and THC content are semi-interrelated. There are obvious relation of chemical characteristics with agronomic characteristics like plant fiber lengths and market values.

The THC Factor

As for the potential of industrial hemp agriculture in America, the THC has been a major limiting factor. Through various agro biotech methods we have been able to lower the THC values. In fact, Industry has lowered THC content below 0.3% and raised the CBD (cannabidiol) content. CBD is the precursor to THC, which is also the antagonist to THC. Like THC, CBD can biologically lock onto anandamine receptor sites in brain cells. If our hybrid plants are used by humans for other than industrial purposes, receptor sites in the brain become filled with CBD not allowing the THC to dock on brain cells. Thus, creating a very low THC content and increasing the CBD content makes the hybrid plants non psychedelic cannabis sativa. (Interview with Dr. Raphael Mechoulam, discoverer of the THC molecule; Journal of the International Hemp Assoc. VOL I # 1.) This is the rule of thumb for all EC countries that grow "true hemp", cannabis sativa, including but not limited to the United Kingdom, France, Spain, and Hungary.

Gas Chromatography THC Analysis Testing

- Step 1 Would require samples taken from the top 5-6 inches of plants cross-vertically over a 20' x 20' section
- Step 2 Dry tops in cotton or paper bags @ 35c for 5-7 days in the dark for best the content storage for 6 weeks was recorded.
- Step 3 Grind leaf material in centrifugal mill over 0.2mm sieve this will help extract the cannabinoids.
- Step 4 Glass culture tube needed put 1. 100mg of leaf powder 2.5ml of hexane containing 0.2mg / ml of squalance as internal standard
- Step 5 Place suspended in an ultrasonic bath for 18 to 22 min. and then centrifuged
- Step 6 The hexane layer will decante and extract the pellet
- Step 7 Repeat one more time with 5ml of hexane
- Step 8 Take combined decanted extracts 1ul inject into a gas chromatograph with out devrivation.

Test should be done on a Varian 3700 gas chromatograph with auto sampler 8000 equipped with a split less injector a flame ionisation detector and a fused silica column (25mm x 0.25mm) coated with CP Sil 5 CB.

- Step 9 Carrier of gas helium flow rate 0.8 ml/min ; split 25ml/ml

This is the procedure the USDA and local farming communities will need to carry out as an ongoing process of monitoring chemical levels in crop production

Seeding method March 12th, 1994

Rates are 48 seeds drilled per square foot and thus 18 to 48 plants per square foot should be expected. We believe that physical plant density measurements on this date fall within the expected parameters for the physical planting density. More accurate measurement will follow on subsequent field trips where a measured yard of field will be counted in a multitude of spots to determine a more accurate plant density and a standard deviation in the measurement. A modified corn drill was used.

Resulting first generation seed data

Field 1 Uniko-B appears not to be a monocious variety as expected. 0% herbicide & pesticide usage.

Field 2 Kompolti TC appears not to be a monocious variety. 0% herbicide & pesticide usage.

Field 3 Futura 77 appears not to be a monocious variety. Has shortness in stem. Seed plants approximately 500 seeds per plant mostly over grown with weeds (Lambsquarter.) 0% herbicide & pesticide usage.

Field 4 Uniko-B (seed crop) female; Approximately 1000 seeds per plant Approximately 1000 seeds per plant result when row planted. 0% herbicide & pesticide usage.

Field 5 Futura 77 appears to be a monocious variety. Has shortness in stem. Seed plants approximately 500 seeds per plant. 0% herbicide & pesticide usage.

Field 6 Kenaf field.

Physical Crop Data (as measured on 5/10/94)

1)	15-30 plants/sq. ft.	avg. height 2' 7"	max. height 3' 8"
Male:Female & Hermaphrodite 1:1			
2)	15 - 30 plants/sq. ft.	avg. height 2' 8"	max. height 4' 1"
Male:Female & Hermaphrodite 1:1			
3)	4 - 8 plants/sq. ft.	avg. height 2'	max. height 3' 6"
Male:Female & Hermaphrodite 1:9			
4)	1.5 plants/lin. ft./row	avg. height 3' 7"	max. height 4' 10"
Male:Female & Hermaphrodite 1:120			
5)	1.65 plants/lin. ft./row	avg. height 2' 6"	max. height 4' 10"
Male:Female & Hermaphrodite 5:53			
6)	avg. height 1' max. height 1' 8"		

Note: Irrigation on this date caused difficulty in measurement of crop density (number of plants/unit area) in fields 1, 2, & 3 and thus resulted in large variations of this density data. It is our belief, however, that these measurements correlate with the planting density of 16 holes per square foot each planted with 1 to 3 seeds. The planting density should result in 16 to 48 plants per square foot at a 100% germination rate. Expected germination rates are 100 seeds per square foot and thus 16 to 48 plants per square foot should be expected. We believe that physical plant density measurements on this date fall within the expected parameters for the physical planting density. More accurate measurement will follow on subsequent field trips where a measured yard of field will be counted in a multitude of spots to determine a more accurate plant density and a standard deviation in the measurement.

The following discussion is intended as a summary of the crop test analysis without discussing the procedures required to obtain the data. The reader is directed to "The Agriculture Handbook 379, U.S. Department of Agriculture" for forage fiber analysis for a more detailed test explanation.

Neutral-Detergent (cell-wall) Test

The neutral-detergent procedure for cell-wall constituents is a rapid method for analyzing the total fiber in vegetable feedstuffs. It appears to divide the dry matter of feeds very near the point that separates the nutritively available (98%) and soluble constituents from those that are incompletely available and dependent on microbial fermentation.

Acid- Detergent Fiber Test

The acid-detergent fiber procedure provides a rapid method for lignocellulose determination in feedstuffs. The residue also includes silica. The difference between the cell walls and acid-detergent fiber is an estimate of hemicellulose; however, this difference does include some protein attached to cell walls. The acid-detergent fiber is used as a preparatory step for lignin determination.

Acid- Detergent Lignin Test

In the acid-detergent lignin procedure, the acid-detergent fiber (ADF) procedure is used as a preparatory step. The detergent removes the protein and other acid-soluble material that would interfere with the lignin determination. The ADF residue consists of cellulose, lignin, cutin, and acid-insoluble ash (mainly silica). Treatment with 72% sulfuric acid dissolves cellulose. Ashing of the residue will determine the crude lignin fraction including cutin. For silica determination and separation of cutin and lignin, see the Permanganate and Acid-Detergent Cutin Procedures.

Permanganate Lignin, Cellulose, Insoluble Ash, and Silica Test

Plants and stock were removed at 60 days of growth.

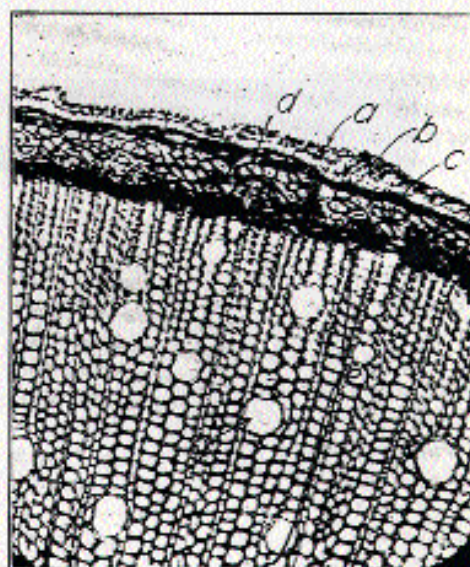
For **bark**, a distinction is made between primary and secondary fibers. Properties of the distinguished stem fractions are summarized. For bark, the chemical properties concern the extracted fibers, which contains high amounts of **cellulose**, the primary, whereas the **woody core** contains less cellulose, the secondary.

Cellulose is derived from the inner Hemp stalk existing in bark fiber and woody core thus making up cell walls of wood core of organic structure. Essentially a chain of glucose molecules. The molecular structure is $C_6H_{10}O_6$. The products which could be produced from this cellulose include, paper, plastic, film, rayon, cellophane, resins, styrofoam, furniture, computer consoles, etc etc.

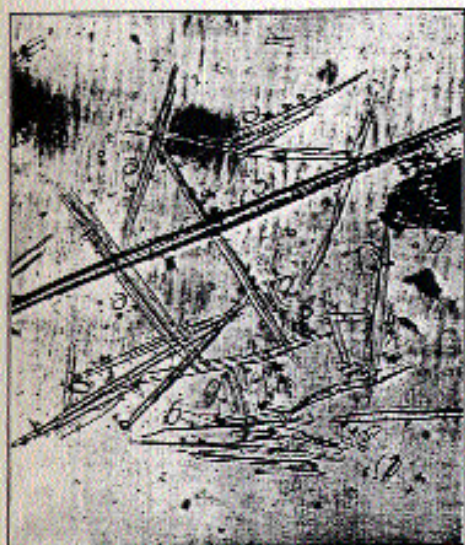
Silica contained in the stalk can be created into powders which are excellent in thermatic qualities (holding heat.). Silica can also be mixed with lime, which petrifies, to form a solid material similar to concrete, without the toxic by-products inherent in concrete production.



Hemp Stalk (*Cannabis Sativa*). Transverse section x25. a, bark containing bast fibers; c, central hollow woody core; f, pith cells



Hemp Stalk (*Cannabis Sativa*). Transverse section x225. a, epidermis; b, cortical parenchyma; c, bast fibers; d, cambium layers; g, vessel

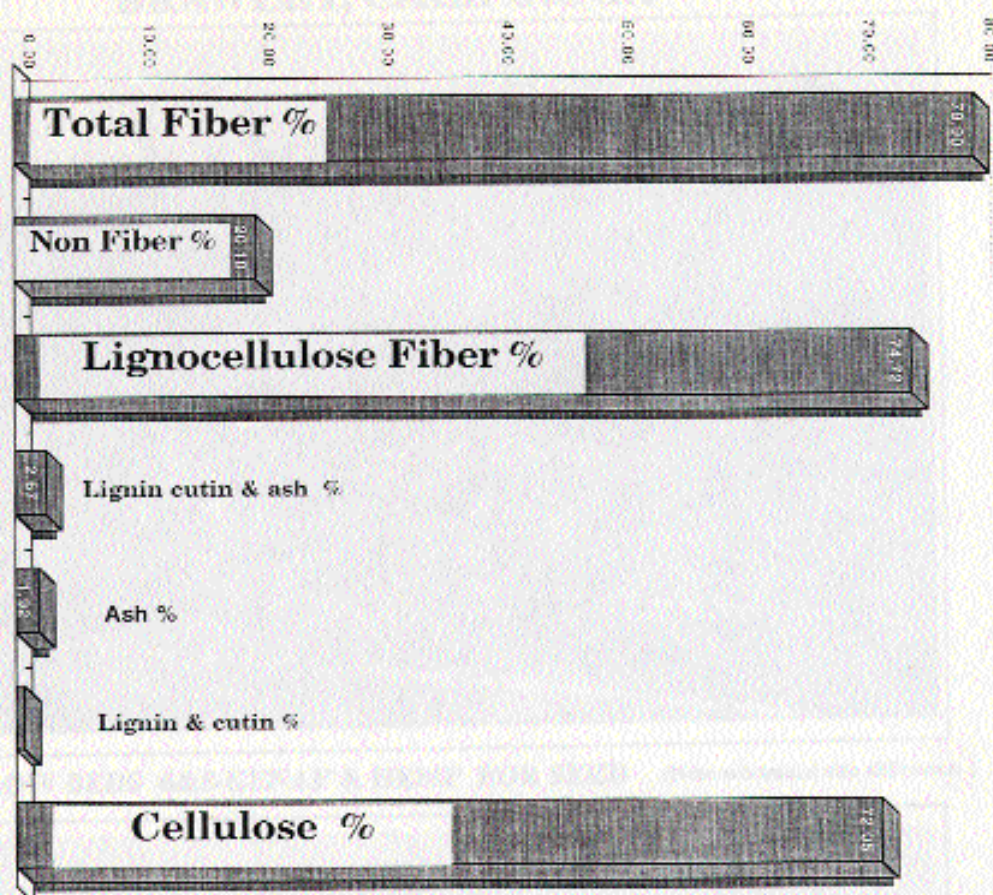


Hemp Stalk (*Cannabis Sativa*). disintegrated x125. a, epidermis; b, parenchyma cells; c, bast fibers; g, vessel

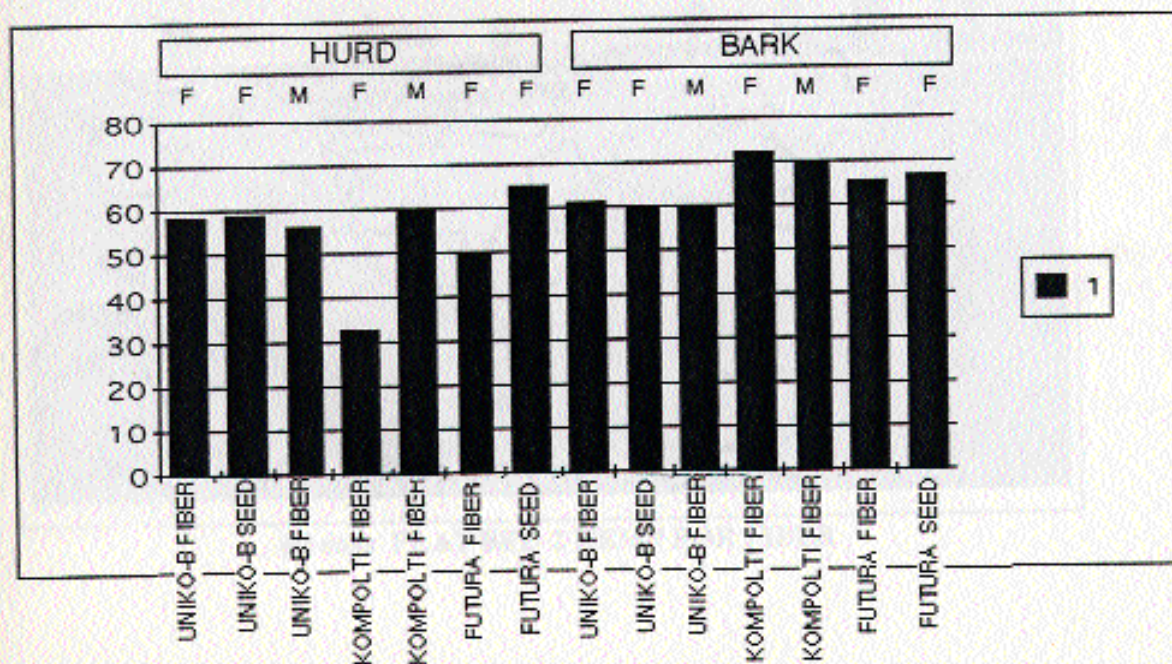
Hemp Biotech Laboratory Analysis Test Results

Test performed on crop at 57 days after germination. All graph vertical and horizontal scales are a % of dry weights.

Dry retted Kompolti-bark (cannabis sativa L.) result.



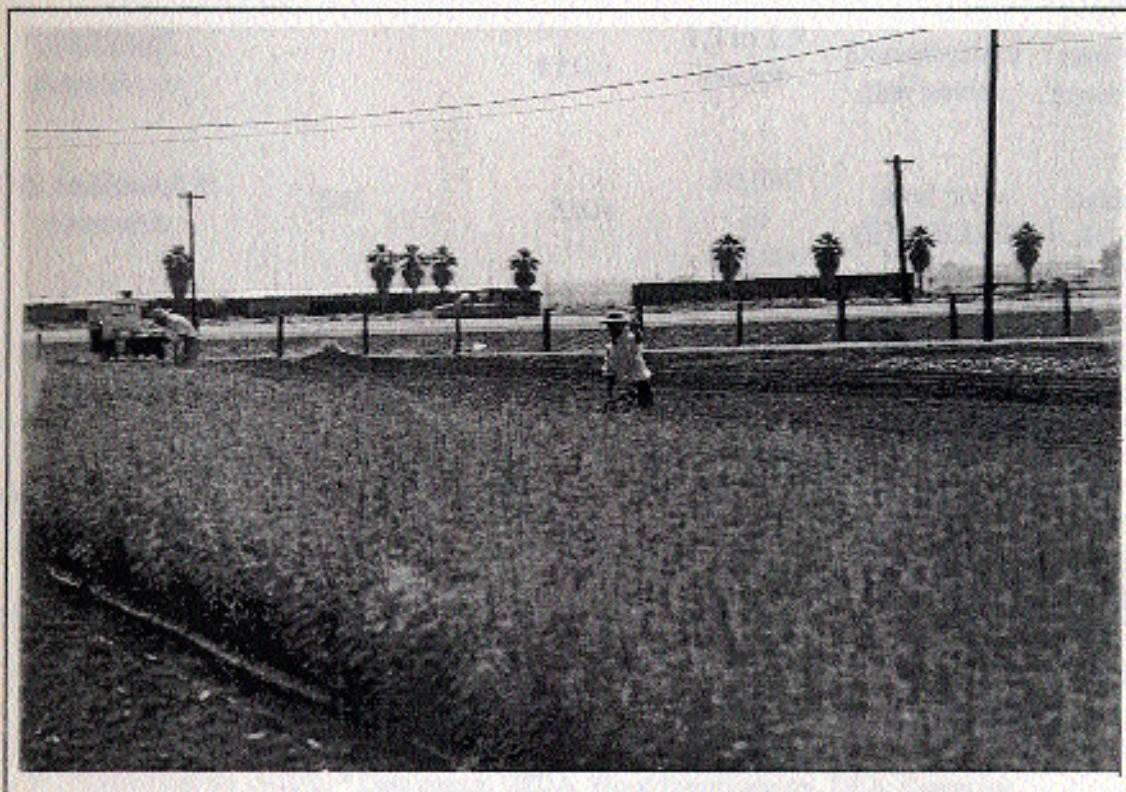
CELLULOSE ACID DETERGENT FIBER & LIGNIN TEST RESULTS



BRAWLEY, CALIFORNIA



60 days ROW BEDS 6&5-KENAF & HEMP FOR SEED (Note substantial size difference..)



60 days FLAT BED 2 HEMP FOR FIBER

MARKETS & LOGISTICS OF POTENTIAL HEMP COMMODITY AND ENVIRONMENTAL IMPACT

HEMP PROJECTS	ECONOMIC CREATION		ROTATING ACRES FACILITIES	EQUIPMENT NEEDED	ENVIRONMENT IMPACT & SAVINGS
	JOBS INITIALLY	4-5 YRS			
ETHANOL lignocellulosic	5	1,134	1.2 to 1.4 million	Hydro pulpers cane harvesters	Reduce carbon monoxides new jobs
PAPER lignocellulosic	4	1609	1.3 to 1.4 million	Hydro pulpers decorticators	Sodium hydroxides protect marginal lands
TEXTILES yarns fibers	7	8750+	1.3 to 1.9 million	Decorticators rice binder	new fiber crop lower pesticides
OIL nutritional & cosmetics	6-8	350+	50,000 to 100,000	seed press (EXPELLER)	health, billions 10-20x value added
FIBERBOARD construction	2-4	2200	200,00 to 600,000	decorticators hydropulpers board mills	reduce logging bio-diversity
INDUSTRIAL mops & filters	2-4	12-20+	22,000 to 90,000	bailers scutching mill	absorbent for oil spills Biodegradable
Totals	28	13,063	6.4 million acres	\$50 million to \$500 million	\$1 billion+

+ *(Statistical era -5-10%) * Data source: USDA, Wood Paper industry, I.F.A. Cotton inc.

THE LEGAL PERSPECTIVE

According to the USDA Emergency Coordinator of Disaster Management and Coordination Staff, Leonard P. Mandrock, the President of the United States of America's Executive Order 12919 of June 3rd, 1994, which delegates responsibilities under the Defense Production Act of 1950, it is merely an update of E.O. 10480 which was signed August 4th, 1953. Under the authority delegated by E. O. 12919, the Secretary of Agriculture can establish priorities in the production and allocation of " food resources", (which is defined to include Hemp.) if the Secretary of Defense or the Secretary of Energy, or the Director of the Federal Emergency Management Agency determines within their respective areas of responsibilities that the exercise of this authority is necessary to promote the national defense.

In the Comprehensive Drug Abuse Prevention and Control act 1970, Congress did not amend the Federal statutory definition of marijuana, in fact a commission recommended the exemption of industrial fiber hemp for emergency production from prohibition. The 1970 act expresses an intent to bring the United States in compliance with United Nation's Convention on Narcotic drugs of 1961 & 1967. The Convention explicitly recognizes the difference between Cannabis grown for it's resin, marijuana and Cannabis grown for industrial purposes. The Convention also exempts industrial Cannabis from coverage and requires parties to the Convention to adopt such measures as may be necessary to prevent the misuse of Cannabis.

In conclusion, no Federal or State court has ever extended or amended the Federal statutory definition of marijuana to include the legal industrial hemp food and fiber industries.

FOR MORE INFORMATION WRITE OR CALL HEMPBIOTEC AT:

HEMP BIO-TEC

HEMPTEC1@AOL.COM

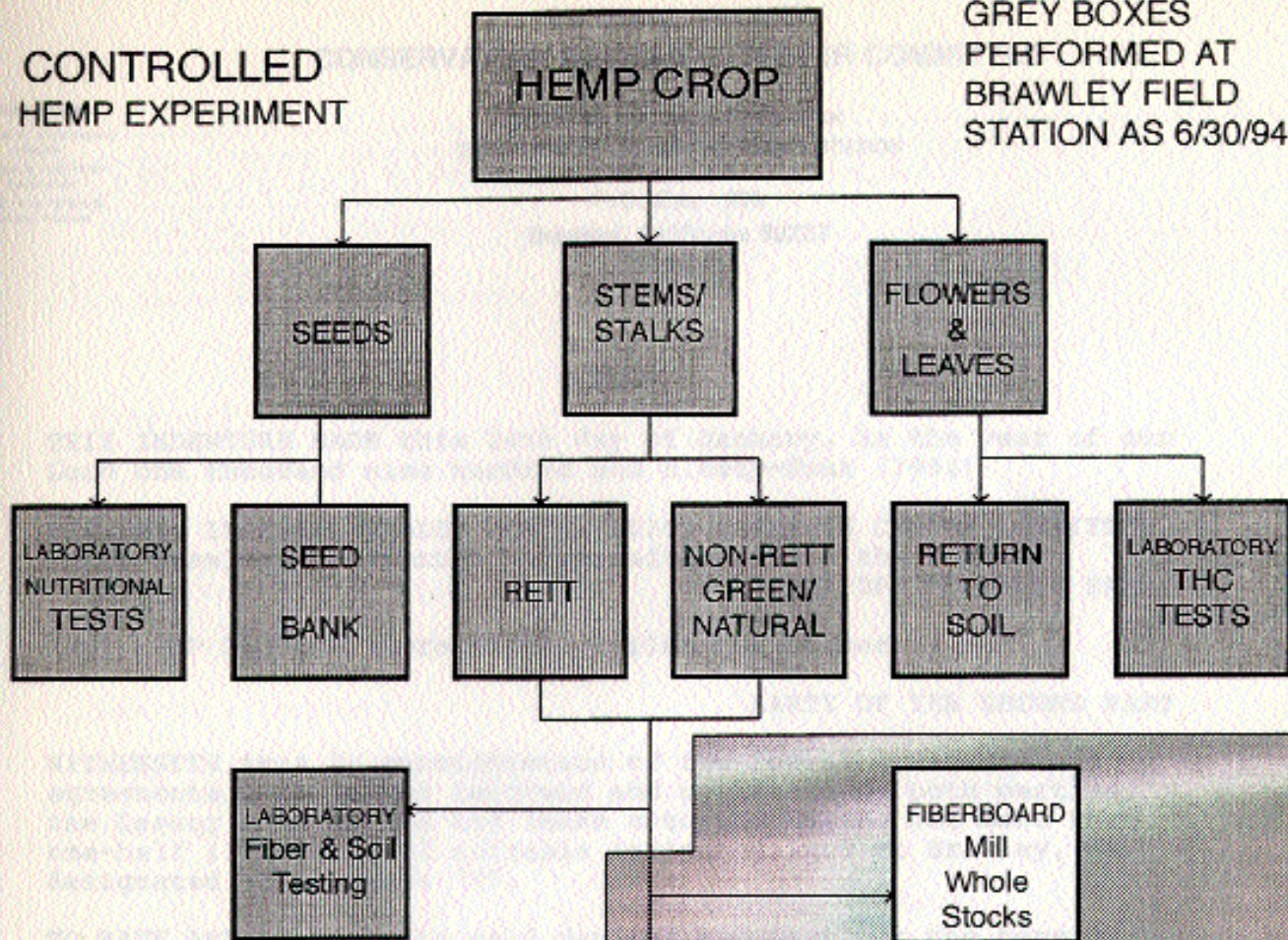
OR PHONE

1-800-284-4367

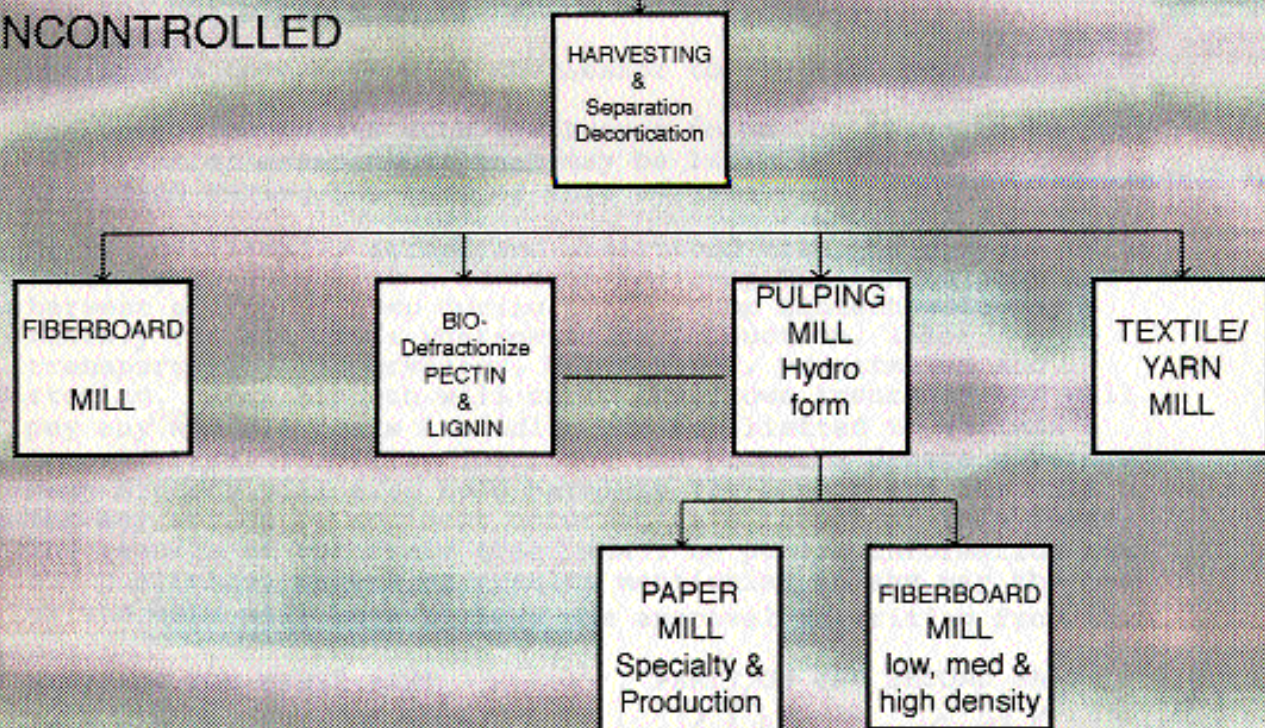
HEMP BIOTECH FLOW CHART OF ACTIVITIES

CONTROLLED
HEMP EXPERIMENT

GREY BOXES
PERFORMED AT
BRAWLEY FIELD
STATION AS 6/30/94



UNCONTROLLED



HEMP AGROTECH Control Chart - WHERE THE CROP WILL GO

**IMPERIAL VALLEY
CONSERVATION RESEARCH CENTER COMMITTEE**

DIRECTORS
JOHN R. KERSHAW
President
JOHN C. MEYSEY
Vice President
VIC WYTTENIS
Secretary-Treasurer

WORKING IN CONJUNCTION WITH
THE IRRIGATED DESERT RESEARCH STATION

**P.O. Box 1375
Brawley, California 92227**

LEASE

THIS INDENTURE MADE this 24th day of January, in the year of our Lord one thousand nine hundred and ninety-four (1994)

BETWEEN: IMPERIAL VALLEY CONSERVATION RESEARCH CENTER COMMITTEE, INC., Brawley, California (hereinafter called the Lessor)
PARTY OF THE FIRST PART

AND: HEMP BIOTECH (hereinafter called the Lessee)

PARTY OF THE SECOND PART

WITNESSETH that in consideration of the rents, covenants and agreements hereinafter reserved and contained by both parties, the Lessor doth demise and lease unto the Lessee not more than one-half (1/2) acre of suitable irrigated land at Brawley, CA. designated in Appendix "A".

TO HAVE AND TO HOLD the said demised premises for the term of seven (7) months to be computed from the first (1st) day of March, 1994 paying therefore the sum of one thousand dollars (\$1,000.00) payable on or before March 1, 1994.

The Lessee covenants with the Lessor to pay said rent.

The Lessor covenants with the Lessee to pay or cause to be paid all taxes or assessments that may be lawfully imposed against said land during the term of this agreement.

It is additionally agreed and understood that the purpose of this lease is to establish a location for Hemp Biotech to grow and harvest a crop of Hemp during 1994. Hemp Biotech will pay monthly for all costs whatsoever of production, labor, transportation, supervision, harvesting, preparation and storing. Hemp Biotech will carry their own insurance and will pay any and all costs including but not limited to Workmen's Compensation, liability insurance and property damage coverage. Hemp Biotech will also hold harmless the Lessor and the USDA for any action or accident occurring as a result of this lease. The results of the field trial shall be public information but any publicity, papers or results mentioning in any way the Lessor or the USDA will have to have the approval in writing from them.

PARTY OF THE FIRST PART

IVCRC
2/4/94
by John R. Kershaw Pres.

PARTY OF THE SECOND PART

for Christopher J. Boush

AGRICULTURAL

SEALER OF WEIGHTS

STEPHEN L. BIRDSALL • COMMISSIONER • DIRECTOR
MIGUEL A. MONROY • ASSISTANT COMMISSIONER • DIRECTOR



COMMISSIONER

AND MEASURES

150 SOUTH NINTH STREET • EL CENTRO, CA 92243-2850
TELEPHONE: (619) 339-4314

February 15, 1994

Mr. Christopher J. Boucher
Director, CEO of HEMP BIOTECH
2060 Placentia B-2
Costa Mesa, CA 92627

Dear Mr. Baucher:

This letter is in response to your request regarding permission to bring planting seed into Imperial County which consists of industrial level genotypes as follows:

- a. Approved Fedrina 74 seeds of France.
- B. Uniko-B which is unisexual female variety.
- c. Kompolti Hybrid TC-Hungarian origin.

We understand that the levels of THC will not be above .0.07% and certified free of weed seeds. These are two important points of acceptance that meets the regulatory criteria. Therefore, permission is granted and you may proceed at your convenience.

Please inform us of the date of arrival, so that our inspector can release the seed and periodically monitor its production. If you require any further information, please feel free to contact our office.

Sincerely,

Stephen L. Birdsall
Agricultural Commissioner

Dick S. Dillon
Deputy Agricultural Commission

DSD/msb

