

HOUSE OF REPRESENTATIVES
STATE OF HAWAII
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**INDUSTRIAL HEMP [CANNABIS SATIVA]-ECONOMIC VIABILITY AND
POLITICAL CONCERNS**

REDISCOVERING INDUSTRIAL HEMP

Countries, such as France, Spain. China. India. Korea and satellite nations of the former Soviet Union have been cultivating industrial hemp for years. A 1961 United Nations Single Convention Treaty specifically allows cultivation of cannabis for industrial purposes. and the more recent NAFTA and GATT international trade agreements recognize hemp as a valid agricultural crop. These international agreements form the basis for reintroducing industrial hemp today.

Some Western countries that had earlier followed the U.S. in banning industrial hemp, have recently changed their legislation.

Canada granted its first public research permit for industrial hemp cultivation in 1994. In 1995 it granted 12 permits, including one for seed production and two for research test plots maintained by the government agricultural departments.

Australia has also begun growing low-THC hemp on an experimental basis. Field trials are being conducted in Tasmania and South Australia, and a two-year study is under way at the University of Tasmania to see whether hemp cultivation would be viable under local conditions. Two major paper companies are conducting their own laboratory pulping trials using materials from the experimental fields with a view to utilizing hemp as a strengthening supplement to wood and straw based paper.

In Great Britain commercial hemp cultivation, though still on a small scale, is under way. Under licenses from the UK Home Office 2000 acres were grown in 1994, up from 1500 acres in 1993. Since the first British hemp was woven into cloth in 1995, English hemp growers have been looking forward to supplying the two biggest markets for ecological products in the world--the U.S. and Germany--both of which had maintained their ban on industrial hemp. England's advantageous position started eroding, however, when Germany legalized hemp cultivation in late 1995.

Before the publication of the 1993 bestseller, ***The Rediscovery of the Resource Hemp Cannabis Marihuana*** [Herer, Broeckers, KATALYSE] there had been little visible interest in hemp in Germany. However, since then a strong hemp lobby has emerged, consisting of Germany's principal farmers' association, representatives from the textile and printing industry, and environmental groups. While these groups set the stage, the legislative changes came about through party and local government initiatives.

Four US states introduced industrial hemp bills in their 1996 legislatures: Hawaii, Vermont, Colorado, and Missouri. Hawaii's bills were held in committee. Colorado's bill [SB 67] passed the Senate but was defeated in the House. Vermont's bill [H783] passed the House and is on its way to the Senate. In Missouri the Hemp Production Act of 1996 [972] was heard, but not voted on, in the Agricultural Committee.

Also in the U.S., an executive order [June 3, 1994. No. 12919] signed by President Clinton included hemp as a strategic food resource. The Commissioner of Agriculture for the State of Kentucky, Ed Logsdon, announced in 1994 that "it's time to look at producing hemp on a commercial basis." Outside of legislative chambers, hemp supporters have formed a multitude of special interest organizations. One of the newest and largest

creations is the North American Industrial Hemp Council [October 1995]. A parallel organization, the Canadian Hemp Council, was formed in Canada [February 1996].

Why this recent commotion about industrial hemp? The initiatives are driven by economic and environmental visions of a flourishing hemp industry in the future. The growing world population requires an increasing supply of resources. Deforestation has been depleting the planet's timber supply while the demand for paper skyrockets. Unlike trees, industrial hemp produces two important resources from a single plant-- cellulose and seed oil--so it can be used to make high quality paper or cloth. Compounding its benefits is the short growing cycle for hemp: four months compared to at least seven years for pulp trees.

VERSATILITY AND ECONOMIC POTENTIAL OF INDUSTRIAL HEMP

Industrial hemp produces three main raw materials: bast fiber, hurds, and seeds. Using these three ingredients in different manners make industrial hemp a versatile product. Moreover, all hemp-based products, including plastics, are biodegradable.

Construction Materials

[e.g. paneling, fiberboard, cement blocks. insulation material]: According to Dave Seber, former president of C&S, a research and development company exploring fibroid alternatives, the future importance of hemp will probably not lie in the areas that hemp has traditionally been associated with, e.g. textiles, but rather in "composites," such as medium density boards and cement-like materials.

Russia, Poland and other Eastern European countries already manufacture composite boards from hemp and other plant materials. In the U.S., researchers at the Washington State Wood Composite Laboratory are working on further refining the technology for hempbased medium density fiberboards. In fact, some of the

first [1995] Canadian hemp crop was contracted to produce samples of such boards. Though of excellent quality, the boards are not yet economical and their future profitability depends on the price of woodchips, which have been fluctuating greatly over the last year. Hemp hurds, alone or blended with wood, can be used in existing mills without major changes in equipment.

Paper

In 1916 the USDA reported that hemp hurds could produce four times as much paper per acre as trees. With increased yields and improved technology this may now be higher. In addition, hemp paper is stronger, can be recycled more often, and lasts longer than tree paper.

Currently, all hemp paper sold in the US is manufactured abroad and must be imported, resulting in prices that are 2-3 times higher than tree paper. Kimberly Clarke, an American Fortune 500 company which manufactures hemp paper for cigarettes and Bibles in France, sells much of their cigarette paper to American companies. Tree Free EcoPaper of Oregon imports paper manufactured in China. The company is in the process of building a paper mill in Oregon that would create 400 new jobs, but without a domestic hemp supply, raw materials will have to be imported, keeping prices high. Germany's largest paper manufacturer has recently converted two mills for hemp-based paper production. Small specialty mills can convert to hemp without too much difficulty and expense, but large scale paper mills would need to retool 40-60% of their equipment.

Textiles

[e.g. diapers, denim, shoes, fine textiles]: As one of the strongest natural fibers available, hemp is an excellent raw material for making various kinds of rope and twine. It is also used to make a wide range of textile products from fine linens to coarse canvas. [Incidentally, the word canvas is derived from cannabis.]

Given currently available technology, production costs for hemp textiles, relative to other fibers, are still high. Bast fibers, such as hemp, tend to have high production

costs because they make up only a certain portion of the plant system and must be separated from the rest of the stem before they can be used in textile or paper production. Besides being labor intensive, the processing of hemp is also hard on existing baling equipment, as it will tend to wrap around the cylinder.

There is, however, a growing market for hemp fabric. Several companies in the US produce textile products from imported hemp fabric. Wait Disney Co. carries hemp products. Esprit will soon begin offering hemp clothes as part of its collection. Fashion designer Calvin Klein has announced plans to use hemp in his clothing lines. Deja Shoe, a company that produces footwear from recycables and earth-friendly materials, will soon be offering hemp shoes, and 100% hemp Converse All Stars are already available. Adidas, Vans and other shoemakers are either marketing hemp-topped sneakers or planning to do so.

Plastics

32-38% of hemp hurds and 53-74% of hemp bark is made up of cellulose, the basic building block of plastics. Until the 1930s hemp-based cellophane, celluloid and other products were common, and Henry Ford used hemp to make car doors and fenders. Today hemp hurds can be used to make new plastic or blended into recycled plastic.

Food Products

Hemp seeds are 20-25% protein. They can be used-to make non-dairy cheese, milk, ice cream, and hemp butter. Food products made out of hemp seed are high in calcium, magnesium, phosphorous, potassium, and Vitamin A.

Hemp seeds can also be pressed for their oil. Hemp seed oil is a rich source of cholesterol fighting essential fatty acids (EFA). U.S. law allows imports of sterilized hemp seeds, but such importation greatly increases production costs while the sterilization process harms the nutritional value of the seeds and hastens rancidity. Hemp seeds

are also commonly used in birdseed and as feed for domesticated animals.

Personal Hygiene

[soap, lip balm. cosmetics]: Hemp oil's high EFA content makes it a suitable ingredient for cosmetics. Most moisturizing products that are on the market today are made from saturated oils which are not absorbed by the skin cells, but only coat the surface to prevent further moisture loss. In contrast, lotions that are high in EFA's can be absorbed into the cells.

Paints and Varnishes

Until the 1930's, most paints were made from hemp and linseed oils. Beyond coating the surface, hemp oil soaks into wood and preserves it.

High quality absorbents

Hemp products are excellent absorbents used in horse stables, cat litter, or oil cleanups. They are more absorbent than wood shavings and compost faster.

Other Products

Seed oil can be combined with 15% methanol to create a substitute for diesel fuel which burns 70% cleaner than petroleum diesel. It is also a good base for non-toxic printing inks. While such inks are currently made from soybeans, hemp is higher in linoleic acids, which means it requires less processing and is a superior drying oil. Hemp seed oil also makes a good all purpose lubricant.

Cargill manufactures a line of 100% plant-based plastic silverware. Plant-based plastics, such as shopping bags, are biodegradable and can be composted at home. In Germany an 100% hemp oil-based laundry detergent is about to go into production. The detergent's advantages include environmentally friendly production and high biodegradability. It can also be made into an industrial cleaner that removes oil and tar from textiles.

POTENTIAL VS. REALITY

Could industrial hemp [if its cultivation is legalized] lead to a thriving industry, creating employment and profits?

Theoretical potential and economic realities are two different things. So far, legal constraints have prevented industrial hemp from being grown on a large scale in most developed nations, so that there has been little incentive to develop new technology that would maximize hemp's profitability.

Community Development

The bottom line of growing hemp is the cost of transportation to a processing center. Since hemp is a bulky crop, it is not cost-effective to ship hemp far for processing. In terms of economies of scale this would appear to be a disadvantage. However, in terms of community economic development, hemp's bulkiness means that, if successful, hemp cultivation will lead to local processing centers and jobs in small weaving factories or seed crushing facilities, and pulp mills. Hemp holds the promise to revitalize certain agricultural communities.

Research & Development

Technology to turn hemp into usable fiber and fiber into desired products is available and new technological developments are under way. Silsoe College in Bedfordshire, Great Britain, for example, has developed a machine comparable to the cotton gin machine, which over two hundred years ago helped reduce the price of cotton a hundred fold. This "decorticator," which is able to extract fiber from the stems of crops such as hemp and flax cheaply, is now undergoing commercial trials. In Belgium a "scutching" machine normally used to extract linen-grade fibers from flax, can also extract fiber from hemp.

The primary focus in hemp technology has been on fiber processing. Work coming out of German flax programs is now being applied to hemp, leading to processes which include a steam explosion/cottonization process to produce cotton-like short fiber. Further technological

modifications or innovations will be needed for full-scale processing of hemp.

Some researchers in U.S. Department of Energy laboratories are studying microorganisms that will detach crude cellulosic fibers from lignin, the natural glue which holds plants together. The results could be applicable to hemp by making a larger part of the plant usable as biomass for energy production.

Seed

More research needs to be done to create strains of hemp that are low in THC, high in fiber and productivity and suited to specific growing conditions. Advances made in one geographic location are not necessarily optimal elsewhere.

In the past, France has been the leader in breeding a low-THC industrial hemp seed that is suited to Europe's cool climate. New, non-French low-THC hemp seed stock is under development in Europe and is expected to be certified by the EEC in the near future.

Comparison with Other Crops

Industrial hemp has often been compared with other crops to show its high profitability. As mentioned above, a 1916 Department of Agriculture report found that an acre of industrial hemp produced four times as much dry fiber as an acre of trees.

Other comparisons can be made, but an equally valid, perhaps even better approach of looking at hemp is one of scaling down expectations and looking at the minimum benefit. This is what Joe Hickey, head of the Kentucky Hemp Growers Cooperative, does when talking to his farmers. He reminds them what they will gain from growing hemp, even if hemp does not make a penny more than a good crop of hay. Hemp is a good rotational crop which stabilizes and enriches the soil, while keeping the field weed-free for the next planting without the costs of herbicides. This is value added, which hay does not provide. According to this view, anything beyond that

value, such as profits from a small decorticator or seed crushing facility, would be an extra benefit to the community.

GROWING CONDITIONS OF HEMP

Hemp is an annual herbaceous plant that can grow to heights of 5-20 ft. during a 3-4 month growing cycle. The plant's rapid growth suppresses weeds and eliminates the need for herbicides, while its relative insensitivity to insects and fungal diseases allows hemp farmers to forego the use of pesticides and insecticides.

Hemp cultivation requires good soil conditions and sufficient supplies of nitrogen and water, especially during the first six weeks. During the early growth period it also requires fertilizer. Later in the growing cycle nutrients are returned to the soil by falling leaves.

Male and female flowers are borne on different plants, though modern breeding in Europe has produced "monoecious" [male and female flowers on the same plant] varieties. Selecting monoecious strains overcomes the problem of different maturation times between male and female plants and results in stalks of more uniform height and weight.

After harvesting, the crop must be retted, a process by which the "glue" [pectin] that holds the fibers and hurds together is broken down. This can be done by simply leaving the hemp stalks lying in the field for 4-5 weeks while mother nature naturally decomposes the pectin, but new retting technologies produce better quality and more uniform fibers in less time.

Because industrial hemp has been grown primarily in moderate climates, most of the available seeds are bred with those climactic conditions in mind. A few low-THC and fiber-rich variety, suited to a slightly warmer climate, are being developed in Hungary under the name of

Kompolti. It is well known that high-THC marijuana grows well in subtropical climates, but more breeding to minimize THC content and maximize fiber productivity in subtropical climates may be necessary.

POPULAR MISCONCEPTIONS REGARDING. THE CULTIVATION OF INDUSTRIAL HEMP

In the U.S. the major popular misconceptions about growing industrial hemp, typically voiced by law enforcement agencies, relate to the THC content of the plant.

Misconception #1: *"Any plant with a 0.5-2.0% THC content can induce intoxication."*

The answer to this argument is fully developed in a scientific article [written in German], authored by three individuals--two medical doctors and one Ph.D. [Michael Karus, Franjo Grotenhermen, and Helmut Schaaf "Potential for misuse of industrial hemp as a drug," in Bioresource Hemp Reader, April 1994]. The article draws on over thirty scientific studies on the effects of the THC substance when smoked. Because smoking produces a greater effect than oral ingestion, the results of these studies are not negated by situations when THC is ingested orally. Below is a summary of two main points made-in the article:

Point 1: There is no linear relationship between dosage and effect. Smoking two hemp cigarettes, whatever the THC content, does not double the effect of one cigarette. This means that industrial hemp with a THC content of less than 0.3% does not produce a psycho-active effect even when consumed in large quantities.

Research results consistently show 5-10 mg THC to be the minimal amount to have any measurable effect. This

amount, though measurable, is not yet perceptible by the smoker. In order to achieve the "desired" effect, the smoker needs 15-25 mg, while 30-35 mg would produce a very strong "high." Since studies also show that the effect depends on the THC being inhaled in a short period of time, the amounts for minimal and desired effectiveness presuppose inhalation within a very short time span.

A marijuana cigarette may be smoked as pure marijuana or mixed with tobacco. The typical cigarette weighs 800-900 mg and is smoked in about 6 [if fast] to 18 [if slow] minutes. The THC in the brain becomes traceable 14 seconds after first inhaling the substance. THC content in the blood plasma reaches a peak after about 3 to 8 minutes during the smoking process, and then falls rapidly again, even with continued smoking. The maximum euphoric effect is reached in 20-30 minutes. and occurs after the THC plasma peak. The effect stays for about 3 hours.

Using these figures, an average 800-900 mg cigarette made from 0.3% THC industrial hemp contains 2.4 to 2.7 mg of THC, which means that a cigarette made from industrial hemp does not achieve the minimal standard [5-10 mg] and is far less than the "desirable" standard [15-25 mg].

After feeling no effects from a low THC cigarette, it is unlikely that smokers would continue smoking this "brand." But even if they did, the effect of THC on the body would not be cumulative.

Point 2: CBD as an antidote. In addition to THC, hemp also contains a substance called cannabidiol [CBD] which functions as an antidote to THC. A CBD:THC proportion of 2:1 largely suppresses THC's psychoactive effects. While all cannabis contains both substances, industrial hemp is low in THC [typically 0.06-0.3%] and high in CBD [>0.5%], accounting for a CBD:THC proportion of over 5: 1.

Marijuana, on the other hand, is high in THC and low in CBD [$<0.5\%$]. A chemical analysis of about 100 hemp varieties found about 40 non-drug varieties with THC:CBD proportions smaller than 1:5. In contrast, the eight drug varieties in the study had large THC:CBD proportions ranging from 2.3:1 to 7.4:1.

The significance of these numbers lies in the fact that industrial hemp, even if it were to induce a "high" [which it does not] comes along with an inbuilt countereffect: CBD. [An interesting side note: Low-THC high CBD hemp cigarettes have been successfully used to help chronic marijuana smokers shed their addiction.]

Misconception #2: *"The effort to legalize hemp is a ruse to legalize the drug."*

There is an increase in the number of groups, companies and individuals who are supporting the cultivation of industrial hemp. In January 1996, the American Farm Bureau Federation, representing 4.6 million members, endorsed industrial hemp by stating: "We recommend that American Farm Bureau Federation encourage research into the viability and economic potential of industrial hemp production in the United States. We further recommend that such research includes planting test plots in the United States using modern agricultural techniques." The Colorado and Kentucky farm bureaus, along with other farming associations, are also in support, while environmental groups see hemp as an alternative for trees for paper.

Companies such as International Paper, Masonite, and Inland Container Corporation have expressed an interest in hemp as an alternative fiber source. The International Paper Company (IP), which has 72,000 employees and annual revenues of \$513 billion, sent four representatives to participate in the founding session of the North American Industrial Hemp Council in

Minneapolis [October 1995]. Half a year earlier [March 1995], the Bioresource Hemp Symposium, the largest-ever such meeting and trade show was held in Frankfurt, Germany. Two hundred and forty participants from 20 countries attended, predominantly researchers including scientists, engineers, and developers of hemp-based products.

Influential political leaders have gone on record in support of industrial hemp cultivation. Canada's Health Minister Diane Marleau called hemp "an excellent commercial and industrial type of crop" with "a great deal of potential." In Germany, Health Minister Horst Seehofer supported lifting the ban on hemp cultivation, saying "we now have strains of hemp which contain such small amounts of the drug THC that they cannot be used for drug production. The principal argument against a continuing ban on hemp cultivation is therefore no longer valid."

Additional evidence that the current movement pushing for legal hemp cultivation is not tied to marijuana advocates lies in the fact the fact that those countries which have legalized industrial hemp have not changed their drug and marijuana laws.

Misconception #3: "Legally cultivated hemp fields will be used to camouflage marijuana patches."

Fields of industrial hemp are ill suited to serve as cover-up for marijuana patches. Industrial hemp is planted about 1-3 inches apart in order to produce long stalks with a minimum of branching. The density means that it is impossible to enter a field without leaving a noticeable trail. In addition, low-THC male industrial hemp pollen destroys the value of any nearby female marijuana plants. The THC content in marijuana is highest in the flower but drops sharply with pollination. For this reason marijuana growers eliminate their male plants in order to prevent pollination. Thus, they would be highly

unlikely to chose industrial hemp as a cover crop. Another factor is that male hemp plants die earlier than their female counterparts, which means that hemp, unless grown for seed., is harvested before the female plant flowers and produces seeds.

Misconception #4: "*There is no satisfactory licensing system to permit hemp production.*"

Licensing systems have been developed in Europe, Australia and Canada and are written into legislation proposed to U.S. legislatures.

The control system in the U.K., where hemp is grown under licenses from the Home Office, has generally worked well. In 1993 there were a few problems with plants being stolen from some industrial hemp fields by people looking for a drug source. By 1995, however. potential drug users appear to have gotten the message that industrial hemp serves them no purpose and have left hemp fields alone.

The hemp bills that were introduced in Colorado and Vermont 1996 both contained detailed licensing provisions. The Vermont bill [H. 783] requires all hemp growers to obtain a state and a federal license. The state license will be valid for 24 months and not transferable. In order to receive it the applicants must:

- a. hold a license from the U.S. DEA;
- b. be in compliance with all federal and state laws;
- c. submit a \$2,000 irrevocable letter of credit or surety bond;
- d. obtain all seeds in compliance with the act;
- e. demonstrate that all parts not used will be destroyed or recycled; and
- f. maintain good record keeping.

The Colorado bill would have required each hemp grower to comply with all applicable federal laws and to

register with a state registered hemp producing association that has bylaws and procedures to adequately control production. The bill also required the association to provide evidence that:

- a. it registers only serious farmers (shown by filing evidence of financial responsibility, through savings accounts or irrevocable letter of credit or surety bond of \$2,000, for use of any person suffering loss or in case a crop needs to be destroyed if out of compliance);
- b. it controls seeds;
- c. it inspects, tests, and has sanctions for members who are repeatedly out of compliance;
- d. it insures that parts (leaves and flowers) not being used are destroyed or recycled.

Misconception #5: *"There is no standard for an acceptable THC level."*

The good news is that there is a standard in place. The bad news is that this standard is quite arbitrary and not necessarily the best one. The European Economic Community (EEC) has agreed on certifying only strains of hemp that contain less than 0.3% THC, as measured in the upper third of the leaf. However, the way this standard came about had more to do with French economic interests than with scientific opinions. With a prior- near-monopoly on 0.3% THC hemp seeds, it was in France's interests to push for this standard within the EEC. The move was successful and has meant that European hemp growers, wishing to qualify for EEC subsidies, purchase their seeds from France, creating a situation of insufficient supplies and high prices.

In the meantime, new hemp varieties are being developed elsewhere. The former Soviet Union originally set its standard at 0.2%. While Eastern European strains do not exceed that limit, several are well below 0.2%. One

strain of low-THC hemp grown in the Ukraine, for example, contains as little as 0.06% THC.

Even though evidence shows that industrial hemp and marijuana are not the same, and even though other law enforcement concerns have been addressed satisfactorily in other countries, the U.S. Drug Enforcement Agency continues to oppose any legislation that would distinguish between industrial hemp and marijuana.

THE POLITICS OF HEMP

When hemp was first regulated in 1937, Congress did not intend to outlaw the legitimate hemp industry. At Congressional hearings after the World War II "Hemp for Victory" campaign, the Deputy Commissioner of the Federal Bureau of Narcotics [forerunner of the U.S. Drug Enforcement Agency] said that marijuana regulations would not have a negative impact on the commercial hemp industry.

Today, however, the DEA and other law enforcement agencies routinely oppose the cultivation of industrial hemp, saying that it would "undermine the public interest" by making marijuana more available. The agencies also oppose any exploration of the topic at forums and meetings. In 1995, the DEA was deeply apprehensive about the founding conference of the North American Industrial Hemp Forum. Prior to the meeting Edwin Sholts, director of Wisconsin's Department of Agriculture Development and Diversification Program, was contacted by several DEA representatives who told him the gathering was "a dumb idea." When Sholts urged them to attend the conference to discuss the issue, they declined.

Regardless of the U.S. DEA's position in the past, government has been known to change its mind quickly. Five years after banishing the hemp industry in 1937, the federal government, suddenly in need of fiber for its

war effort, changed its policies and encouraged American farmers to grow industrial hemp. At the same time the U.S. Department of Agriculture produced a documentary film "Hemp for Victory," extolling the virtues of the plant.

Canada's equivalent of the U.S. DEA finds that that country's police forces are "reasonably happy" with their country's legislation regarding the experimental cultivation of industrial hemp. According to Ross Hossie, Chief of Canada's International Control and Licensing Division, Canadian police generally do not consider hemp cultivation a "great idea," but they prefer to not take an opposing stand during the legislative process. Instead, Hossie says, they are prepared to wait for the completed legislation and regulations.

Some people have suggested that Congress should rethink the role of the DEA and place industrial hemp under the jurisdiction of the Department of Agriculture rather than leave it under the control of the Drug Enforcement Agency. A similar question of whether to place oversight over hemp cultivation under the agricultural or health department is under consideration in Germany.

Will it take another national emergency to take action on industrial hemp? Elected officials do not want to be seen as being soft on crime and they know that a vote in favor of industrial hemp may be construed in this way. But the political effectiveness of confusing marijuana and industrial hemp depends on a public that has a limited understanding of the issue.

In Kentucky public opinion has shifted because of greater awareness. In 1993, the governor convened a task force to explore the viability of hemp for the state. However, for reasons unknown, the chairman disbanded his task force prematurely and issued a hastily assembled report which was not endorsed by many of the task force members. The net effect of the task force's creation and demise was that the issue of growing industrial hemp

received broad publicity in the Kentucky's media, in the process educating the state's people about the difference between hemp and marijuana. As a result, a March 1996 survey found 77% of Kentuckians favor reintroducing industrial hemp in their state.

There is no guarantee for a future of hemp in the U.S. or in Hawaii, but given hemp's versatility there is a fair chance of success. Legislators, seeking to minimize the political risk associated with the hemp issue, are looking for commitments by large and respectable companies interested in investing in the new industry. That, however, may be putting the cart before the horse. What is needed first is a better understanding of the issues involved and small scale experimental cultivation to generate some of the data that businesses would like to have in hand before committing themselves.

This report was designed to provide some background information and to help generate a public discussion in Hawaii.

"Why use the forests which were centuries in the making and the mines which required ages to lay down, if we can get the equivalent of forest and mineral products in the annual growth of the fields?"

--Henry Ford--

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