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Cannabis, Waste and Cash: Revenue, Investment and M&A Opportunities From the Imminent Accelerated Growth of the Marijuana Industry

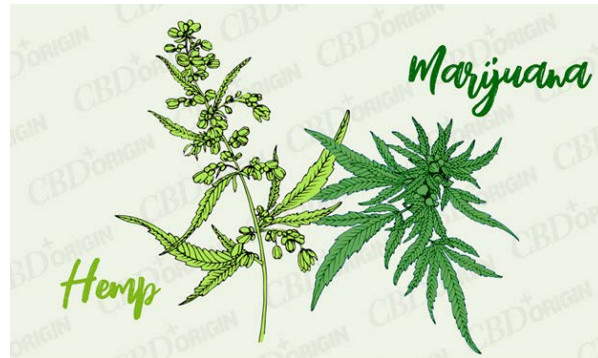
In the cultivation and processing of marijuana and hemp, the industry confronts environmental questions including how to make packaging recyclable, reduce water and electricity consumption and, in some cases, safe disposal of hazardous chemicals used in processing.

By Pauli Overdorff

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Last year was a turning point for the maturing and growing marijuana market. Cannabis-related companies raised nearly \$14 billion in capital in 2018, compared to just \$3.5 billion in 2017, according to Viridian Capital Advisors, a financial and strategic advisory firm for the cannabis industry.

Growth of cannabis revenue, investment and M&A opportunities should greatly accelerate as big states such as New York and New Jersey take the anticipated step of legalizing the sale of recreational marijuana. New York Governor Andrew Cuomo recently said he expected such legislation to be approved by June of this year. In addition, it is now more of a matter of "when," not "if" Congress will allow the marijuana industry to use the commercial banking system, which will be a major factor in a growth boom.



Ten states including

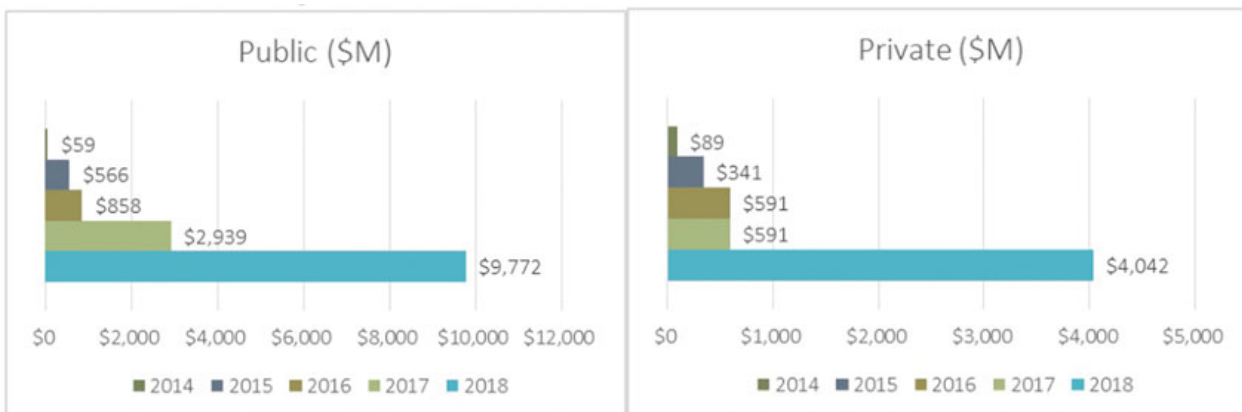
Alaska, Washington, Oregon, California, Nevada, Colorado, Michigan, Vermont, Massachusetts and Maine have legalized both recreational and medical marijuana. Thirty-three states have legalized medical marijuana.

Perhaps the most notable cannabis trend of 2018 was the rush of big alcohol and tobacco companies taking stakes in the market. Among the splashiest was Corona beer brewer Constellation Brands' \$4 billion stake in Canopy Growth. Also, Denver brewer Molson Coors announced a joint venture with The Hydrophocary Corporation, a Canadian cannabis producer, and Marlboro cigarette maker Altria said it would invest \$1.8 billion in Toronto-based Cronos Group, a "global cannabinoid company." Big alcohol and big tobacco are highly regulated industries and are institutionally conversant with the state by state regulations on cultivation, processing, disposal, sales and marketing.

In the U.S., marijuana remains federally illegal and its interstate commerce is banned, giving a leg up to big alcohol and big tobacco as well as the larger, multi-state operators like MedMen, Green Thumb,

Cresco, Palliatech and Columbia Care. New ventures in CBD (or cannabidiol) product lines have attracted investments in 2018.

Until about six months ago, the majority of the activity was outside the U.S. market because of federal laws barring access to the commercial banking system and interstate commerce. Large pools of capital, both public and private, are anticipating that the U.S. market will become the largest cannabis market in the world.



*Capital raised by cannabis-related companies: totals for 2018 through December 14.
Chart courtesy of Viridian Capital Advisors.*

Hemp and Marijuana: Cannabis Species

Cannabis has two primary species—hemp and marijuana. Each plant species contains a variety of compounds called Cannabinoids, the most dominant are Tetrahydrocannabinol (THC) and Cannabidiol (CBD). Hemp contains a very low concentration of THC (0.3 percent or less), Marijuana is abundant in THC with concentrations of 15 percent to 40 percent and is grown for its psychoactive properties for recreational or medicinal use.

Hemp, on the other hand, is primarily used for industrial purposes as it is capable of producing hundreds of crucial resources such as paper, clothing, building materials, biofuel, food products, oils and more. With the fast-growing popularity of CBD across the globe, hemp is also used to produce a wide variety of THC-free CBD products.

The level of THC in hemp versus marijuana plays a role in how each plant is processed and used. It is also the defining factor in the legality of each plant and the regulations governing waste disposal. Each state will have varying laws based on the usage, sales, transportation and cultivation of Hemp, which will widely depend on the THC-content of the Hemp plant.

According to the 2018 U.S. Hemp Crop Report, a measure of the industry's growth is the huge expansion of U.S. hemp acreage. In 2017, 23 states had 25,713 acres of cultivation, and in 2018 acreage tripled to 78,176 acres of hemp grown in those 23 states. The top five hemp growing states in 2018 were Montana, Colorado, Oregon, Kentucky and Tennessee. The hemp plant, which has multiple industrial uses including extracting CBD, is a variety of cannabis plant with less than 0.3 percent of the psychoactive THC (or tetrahydrocannabinol) compound.

Cultivation and Processing of Hemp and Marijuana

In the cultivation and processing of marijuana and hemp, the industry confronts environmental questions including how to make packaging recyclable, reduce water and electricity consumption and, in some cases, safe disposal of hazardous chemicals used in processing.

Challenges include how to handle producers' organic wastes: stems and root balls, exhausted growing medium, failed plants, and diseased or otherwise unmarketable leaves, buds and seeds. These will be produced in increasing quantities as more jurisdictions legalize marijuana for medicinal and/or

recreational use. Its current organic waste output, roughly estimated at several million pounds annually across the U.S., is small when compared with food industry, agriculture and other sources. But a combination of the plant's unique qualities and strict government controls make waste handling a complex matter from a regulatory perspective, and cannabis waste will greatly expand as state after state legalizes its use.

State and Canadian provincial governments have enacted detailed regulations for all aspects of cannabis production and use, which vary from state to state, and even among local jurisdictions within a state.

Despite the differences, the aim is generally to maintain quality control and ensure the drug is not diverted into the black market, an important consideration when marijuana remains illegal in neighboring jurisdictions.

The regulations governing marijuana producers' organic wastes are comprehensive, detailed and strict. Unlike other agricultural industries, marijuana growers in many jurisdictions must keep records of every ounce of material discarded. Some states require that each plant get its own identification and tracking tag, or that responsible parties from the producer accompany the wastes to any external disposal sites. Oregon's rules are typical: detailed data must be entered into the state's Cannabis Tracking System. In addition, growers "must maintain accurate and comprehensive records regarding waste material that accounts for, reconciles and evidences all waste activity related to the disposal of marijuana."

Growers usually must keep cannabis waste inside a secure storage area with access limited to authorized personnel. These areas must be under constant video surveillance, with the images retained for up to 90 days.

Most states and Canada require that the waste materials be held unaltered for three business days, allowing time for inspection in case of concerns about how a grow operation is being managed. Careless handling of the wastes could get growers in trouble with federal authorities as marijuana remains illegal under the Federal Controlled Substances Act.

Managing the Organic Waste of Marijuana

Common options for growers include:

- **Shredding and Compacting:** Most common, and the minimum requirement set by most governments. The wastes can be shredded or compacted, mixed onsite with at least an equal amount of organic or inorganic material that makes the waste unrecognizable and unusable. At this point the waste can be handled like any other waste.
- **Onsite Composting:** Composting the residuals on site and applying compost to fields as a soil amendment is a practical and inexpensive treatment. Some states limit the amount that can be applied in this way. Oregon, for example, allows up to 100 tons per year of vegetative material per installation, as long as there are no pollution or odor issues. A composting facility permit would be necessary for more than 100 tons annually.
- **Bokashi Process:** Using this process, the wastes are shredded and mixed with an equal amount of other compostable material, water and an activator and placed in airtight drums onsite. After two weeks in this biologically active, anaerobic environment, the process produces a liquid suitable for use as a fertilizer, and a solid portion that can be applied as a soil amendment. The short processing time, and its small footprint, make the Bokashi process appealing, but determining the amount of activator used in the process requires professional expertise.
- **Aerobic Digestion:** New systems have been developed for aerobic digestion, such as technology from Micron Waste Technologies in Vancouver, Canada. Aerobic digestion treats finely shredded cannabis wastes combined with a proprietary blend of bacteria in an aerobic chamber that cleans the liquid residue to a standard that enables sewer disposal or non-potable onsite uses.

Composting Option

If the wastes have been combined with inorganic garbage, the mixture must be trucked to a landfill site. If incorporated with other organic waste, it can be trucked to a composting facility or anaerobic digester. Most jurisdictions allow growers to choose between the inorganic and organic disposal routes.

Compost feedstock that includes cannabis is like any other green waste—it composts just fine, and there is no potential diversion to the illegal market. But the composting option faces impediments: composting facilities often are not available within a financially viable transport distance from producers; some grow operations have too little non-cannabis organic material to create the required 50/50 mixture; and it involves the logistics and expense of separate collection of all organic wastes—cannabis and non-cannabis—throughout the facility.

Hazardous Marijuana-Related Waste

Many growers will generate hazardous waste in the processing of medical and recreational marijuana. Hazardous waste is also generated in the production of CBD. Hazardous waste must be disposed of in a manner consistent with federal, state and local laws, regulations, rules or other requirements. This waste category may include, but is not limited to, many types of pesticides or other chemicals used in the cultivation process, certain solvents or other chemicals used in the production of marijuana concentrate, and marijuana soaked in a flammable solvent for the purposes of producing a marijuana concentrate, as well as mercury-containing lighting. Each grower or producer must determine which regulations apply to the waste before it is disposed. Hazardous wastes must be disposed of properly by a registered hazardous waste transporter shipping to a hazardous waste treatment, storage and disposal facility (TSDF). If a producer generates wastes that are regulated hazardous wastes, each state is likely to require a notification to the state regulatory agency and an EPA identification number before wastes can be accepted for disposal by a TSDF.

Opportunities for Revenue, Investment and M&A in Cannabis Waste

Composting facilities that serve states where medical and/or recreational marijuana is legal will have an opportunity to enter the market and gain share, as well as expertise, providing them with an early jump on national competitors. The states with the most multiple organics composting sites are Massachusetts, Ohio, California, Louisiana and New York. These are states that have legalized medical marijuana where recreational marijuana is likely to be legalized shortly.

Regional solid waste haulers specializing in organics recycling may be more nimble in responding to the demand of local growers and processors with competitive programs that provide solutions for the 50/50 mixture required for composting, as a value-added service, as well as offering competitive rates for hauling.

California, a “legal marijuana state,” leads the nation in financial assistance for composting and anaerobic digestion infrastructure via California Climate Investments, a statewide program that puts billions of dollars from the state’s Cap-and-Trade auction proceeds toward reducing greenhouse gas emissions (GHG), strengthening the economy and improving public health and the environment—particularly in disadvantaged communities. The purpose of the California initiatives is to lower overall greenhouse gas emissions by expanding existing capacity or establishing new facilities in California to reduce the amount of California-generated green materials, food materials or alternative daily cover being sent to landfills. In FY 2016 to 2017, \$12 million was made available for composting projects, \$12 million for anaerobic digestion projects and \$5 million for new or expanding existing food waste prevention projects. This money is available to private enterprises to expand composting programs for composting cannabis.

Anaerobic Digestion (AD) is a technology that could also be deployed to handle the waste from the cannabis industry. AD remains technically attractive for its ability to process a wide variety of biogenic materials. Billions of tons of readily available feedstock are potentially suitable. AD can provide energy and beneficial environmental mitigation of human activities including greenhouse gas release, and positively impact large scale agriculture and urbanization.

Companies that invest and develop AD for the cannabis market are likely to find markets in the waste water treatment sector as well as in the organics and food recycling industry. There appears to be a solid investment opportunity for technology that improves the system design and biogas reactor for high solid waste content.

AD is well developed in the European Union, where there are many AD technology companies. The market is highly fragmented and ripe for industry consolidation. However, the U.S. AD market remains underdeveloped and economically challenged. Excluding wastewater treatment plants, the primary market for anaerobic digestion, there were only 260 operational digesters in 2015, according to the U.S. EPA.

A Growing Industry

Other revenue, investment and M&A opportunities exist among the environmental consultants and engineering companies that provide regulatory advice on the myriad requirements in each state. Cannabis consultants are likely to see business boom in this growing industry. | **WA**