

HG HYDROGREEN GLS 808 · KARNOT CLIMATE CONTROL · FEED-AS-A-SERVICE

# 912,500 kg of fresh fodder per year. *From one heated room.*

Karnot HydroGreen is a climate-controlled hydroponic vertical pasture system. We bring the cattle, dairy and livestock fodder indoors, regulate the room with R290 heat pumps and PCM thermal storage, and grow fresh nutrient-rich fodder 365 days a year on 95% less water, 93% less land, and a feed conversion ratio that beats grain-fed control by 12.5%.

A SINGLE HYDROGREEN 5-PACK · PER KARNOT ANIMAL SCIENCE FEED TRIAL, 2024

**15,875 kg**

Fresh fodder per day

5 levels x 8 modules per machine · 5 machines per 5-pack · 365 days/yr

**2,000**

Head of cattle fed per 5-pack

Commercial operation · 8 kg/head/day average · 1,200 m<sup>2</sup> footprint

**5 day**

Seed to harvest

22% DM wheat, 19% DM barley · 24/7 climate-controlled growing

Three problems traditional fodder cannot solve. *HydroGreen solves all three.*

**Climate & mould:** bad climate conditions cause mould. HydroGreen runs 24/7 closed-loop climate control. **Water:** traditional grazing wastes water; HydroGreen recycles 95%. **Consistency:** seasonal grass quality varies; HydroGreen delivers identical nutrient density every single day of the year. The result: **+12.5% feed conversion, +29% urea nitrogen (protein metabolism), +9% NDF digestion** — every 1% NDF gain = +0.5 lb milk/day per cow (Oba et al., 1997).

— WHY CLIMATE CONTROL IS THE WHOLE GAME

# The seed is HydroGreen's. The climate room is *Karnot's*.

HydroGreen ships the proven 8-level vertical pasture machine — grain in, fodder out, 5 days seed-to-harvest. What turns it into a 912,500 kg/yr commercial fodder centre in PH conditions is the **climate-controlled growing environment**: holding 18–22 °C and 60–75% RH against a 32 °C tropical ambient, 24/7, with brownout-proof backup. That is what Karnot brings — R290 heat pumps for the cooling and dehumidification, PCM thermal batteries for the buffer, iSAVE for the control logic, iVOLT solar so the room runs on sunlight.



### Why grass doesn't grow at 32 °C in a tin shed

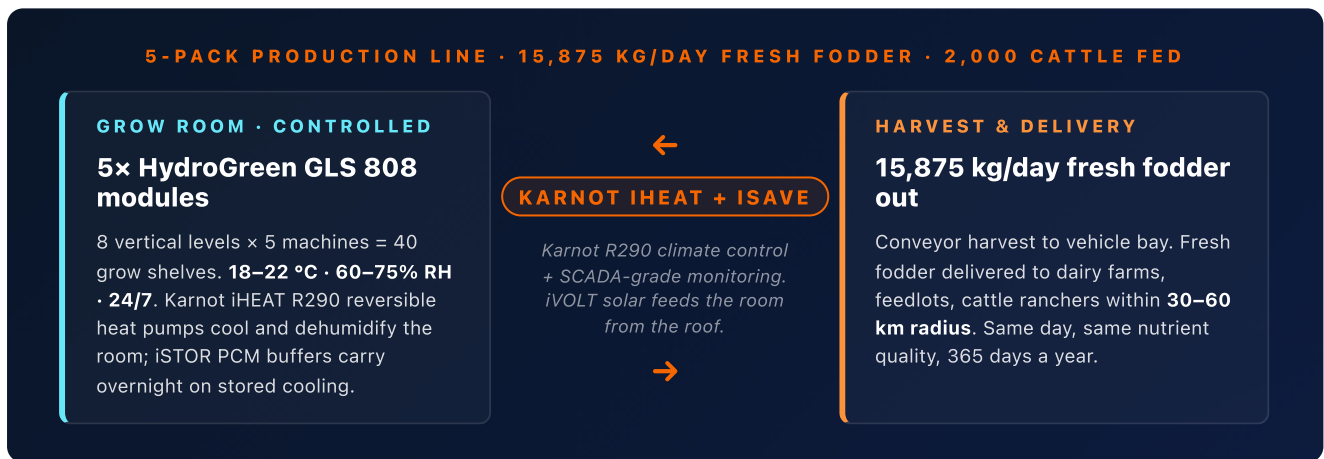
Wheatgrass and barleygrass want **18–22 °C, 60–75% RH and dark/light cycles you control**. A Philippine tin shed is 32 °C, 85% RH, with 8–12 hr brownouts. Without active climate control, the room turns into a mould factory in **72 hours**. The HydroGreen catalogue itself names this as **problem number one**. Karnot R290 heat pumps + iSAVE controls solve it.



### 95% less water than grazing · 93% less land

HydroGreen GLS 808 recycles **173,333 L/day of irrigation water** through a closed loop. Of every gallon applied, **0.75 lb of dry matter is produced** — the highest water-use efficiency of any livestock feed source. A 5-pack uses **15,141 L water/day on 1,200 m<sup>2</sup>** to produce what **500 acres of farmland** would otherwise grow.

— THE INTEGRATED PLATFORM · HYDROGREEN + KARNOT



— THE FOUR BOXES · HYDROGREEN-KARNOT INTEGRATED KIT

<p><b>HydroGreen GLS 808</b></p> <p><b>8-level · 20m x 2.45m · 5.5m tall</b></p> <p>Vertical pasture machine. <b>5 days seed to feed</b>. 22% DM wheat / 19% DM barley. <b>Up to 2M lbs fresh feed per year per system</b>. Replaces 500 acres of grazing.</p>	<p><b>Karnot iHEAT R290</b></p> <p><b>Reversible · 25–100 kW</b></p> <p>R290 heat pump for the grow room. <b>Cools and dehumidifies in tropical PH ambient</b>, holds 18–22 °C and 60–75% RH against 32 °C ambient. COP 4.0+. EN 378 outdoor install. No combustion in the grow room.</p>	<p><b>Karnot iSTOR PCM</b></p> <p><b>38 kWh · 8–12 hr backup</b></p> <p>PCM thermal battery. <b>Carries the grow room through any PH brownout</b> on stored cooling alone. The crop survives the outage. Mould risk eliminated. Rated for 1,500+ charge cycles.</p>	<p><b>Karnot iSAVE + iVOLT</b></p> <p><b>SCADA + Zero-export solar</b></p> <p>iSAVE 24/7 monitoring of temperature, humidity, CO<sub>2</sub>, water flow, harvest weight. <b>Predictive maintenance via MQTT</b>. iVOLT solar PV sized to run the climate kit + lighting from sunlight. Per-kg billing via Cooling-as-a-Service platform.</p>
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— ANIMAL SCIENCE FEED TRIAL, 2024 · REPLICATED PEN STUDY

**12.5% better feed conversion. 10% lower cost of gain. Significant at  $p < 0.05$ .**

Replicated pen study: 4 pens, 40 backgrounding beef cattle, balanced for age, size, sex and genetic background (Angus composite). Each pen randomly assigned to **HydroGreen-included diet** (~22% inclusion) vs **conventional grain control**. Variables: feedlot performance, blood serum parameters, nutrient digestibility, cost of gain. Period: 05/2021 – 08/2021 (Week 0–12). Confirmed in 2022 with an Angus x Holstein dairy-beef cross study (n = 462 head, 09/2022 – 12/2022).

VARIABLE · BEEF BACKGROUNDING STUDY (WEEK 0–12)	HYDROGREEN	CONTROL	DIFFERENCE
Daily Rate of Gain (lb/day)	2.54	2.28	<b>+11.4% · <math>p=0.03</math></b>
Dry Matter Intake (lb/day)	21.8	20.0	<b>+9.0% · <math>p&lt;0.001</math></b>
Feed Conversion Ratio (DMI/DRG)	7.61	8.70	<b>-12.5% better</b>
Cost of Gain (\$/lb)	0.73	0.81	<b>-10% cheaper</b>
NDF Digestion (% of aNDF)	52.1	47.5	<b>+4.6 points (+9.7%)</b>
Blood Urea Nitrogen (mg/dL)	22.2	17.2	<b>+29% · <math>p&lt;0.001</math></b>

**Take-home result, dairy translation**      **+9% NDF**      **baseline**      **+2.3 lb milk/cow/day**

Source: Karnot HydroGreen Animal Science Feed Trial Summary, April 2024. Backgrounding pen study n = 40, Angus composite, 05/05/21 – 08/31/21. Beef growing follow-up n = 462, Angus x Holstein cross, 09/23/22 – 12/16/22 — confirmed the daily rate of gain and feed conversion improvements at commercial scale. Dairy translation per **Oba et al., 1997**: each 1% increase in NDF digestion = +0.5 lb milk production/cow/day and +0.4 lb DMI/cow/day. HydroGreen feed: 22.4% DM, 15.7% crude protein, **49.2% water-soluble carbohydrates**, 5.9 MJ/kg net energy of gain — the WSC level is what drives the rumen response. Hydrogreen is fodder, but not all fodder is HydroGreen.

— WHAT THIS MEANS IN PESOS · FOR A 200-HEAD PHILIPPINE DAIRY

<p><b>PER COW / DAY</b></p> <p><b>+2.3 lb</b></p> <p>Additional milk at +9% NDF digestion. <b>200-head dairy = +460 lb/day · ~209 L/day extra milk</b> at no extra cow.</p>	<p><b>PER HEAD / MONTH</b></p> <p><b>-15%</b></p> <p>Cattle finishing time cut from 100 to 79 days (<b>21 days faster</b>). 4 cycles per year instead of 3.</p>	<p><b>PER HERD / YR</b></p> <p><b>₱4.6M</b></p> <p>200-head dairy operation: <b>~₱4.6M/yr additional milk revenue</b> at ₱60/L wholesale, before any HydroGreen subscription cost.</p>	<p><b>PER KG FODDER</b></p> <p><b>₱16</b></p> <p>Karnot Feed-as-a-Service price per kg fresh fodder delivered. <b>200 head x 8 kg/day = ~₱25K/day in feed, ~₱9M/yr.</b></p>
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— FEED-AS-A-SERVICE · ZERO CAPEX FOR THE FARMER

# Karnot owns the room. *You take delivery of the fodder. By the kilo.*

A Philippine dairy farm or cattle operator does not need to own a HydroGreen GLS 808, finance a 1,200 m<sup>2</sup> climate-controlled building, or hire a climate-control engineer. **Karnot Feed-as-a-Service (FaaS) flips the model:** Karnot owns the HydroGreen 5-pack, the iHEAT R290 climate kit, the iSTOR PCM buffer and the iVOLT solar, and bills you only for the kilos of fresh fodder you take delivery of. Same architecture as Cooling-as-a-Service from our cold storage centres — the iSAVE platform handles the per-kg billing automatically. You pay for what you eat.

## Three roles. *One contract. Same per-kg price as good silage, but year-round and consistent.*

### KARNOT OWNS

#### The HydroGreen kit and the climate-controlled building

5x GLS 808 modules + iHEAT R290 + iSTOR PCM + iVOLT solar + iSAVE platform. 1,200 m<sup>2</sup> building. Bank-financed under DBP / LandBank green-loan + BOI Pioneer ITH under RA 11285. Karnot files everything.

### FARMER PAYS

#### Per-kg fresh fodder, delivered same day

~**₱16 per kg of fresh fodder delivered.** Minimum off-take agreement for 365 days. iSAVE bills automatically based on actual harvest weight + delivery log. Per-head subscription option also available (~₱125/head/day for 8 kg).

### FARMER KEEPS

#### Better milk, better meat, lower vet bill

+9% NDF digestion = +0.5 lb milk/cow/day per 1% NDF gain. +29% blood urea nitrogen = better protein metabolism. ~**₱23,000 extra milk revenue per cow per year** on a 200-head dairy — before counting the ~21 day finishing time.

FaaS removes the three traditional barriers to HydroGreen adoption in PH: **(1) CAPEX** — there isn't any for the farmer. **(2) Climate-control expertise** — Karnot operates 24/7 from iSAVE. **(3) Water reliability** — closed-loop, 95% recycled. The farmer signs an off-take agreement for kilos of fodder. That's it.

**“ Every Philippine dairy farm and feedlot has been told they cannot have fresh, consistent, high-nutrient fodder year-round because the climate, the water and the land are all against them. HydroGreen GLS 808 proves they can — and the Karnot R290 climate-control room makes it work in 32°C tropical ambient on solar power. Feed-as-a-Service flips the ownership: Karnot finances the kit, runs the climate, harvests the crop, and bills the farmer per kilo delivered. The farmer keeps the milk uplift, the faster finishing, and the lower vet bill. The numbers are not subtle. ”**

Stuart Cox · Founder & CEO · Karnot Energy Solutions Inc.

### STEP 1

**₱0**

You send us your herd size, location and target start date. **Free FaaS feasibility report** within 2 weeks.

### STEP 2

**2 yr**

Off-take agreement signed. Karnot files BOI + green loan. Building permits go in. **3–4 month build.**

### STEP 3

**5 d**

Seed-to-feed cycle. Day 1 grain in, Day 5 fresh fodder delivered. **From day one of operations onwards.**

### STEP 4

**₱16/kg**

You pay per kilo of fresh fodder delivered. **Auto-billed via iSAVE.** Cancel any time on 90 days' notice.