

# Production of biogas in the county of Västmanland

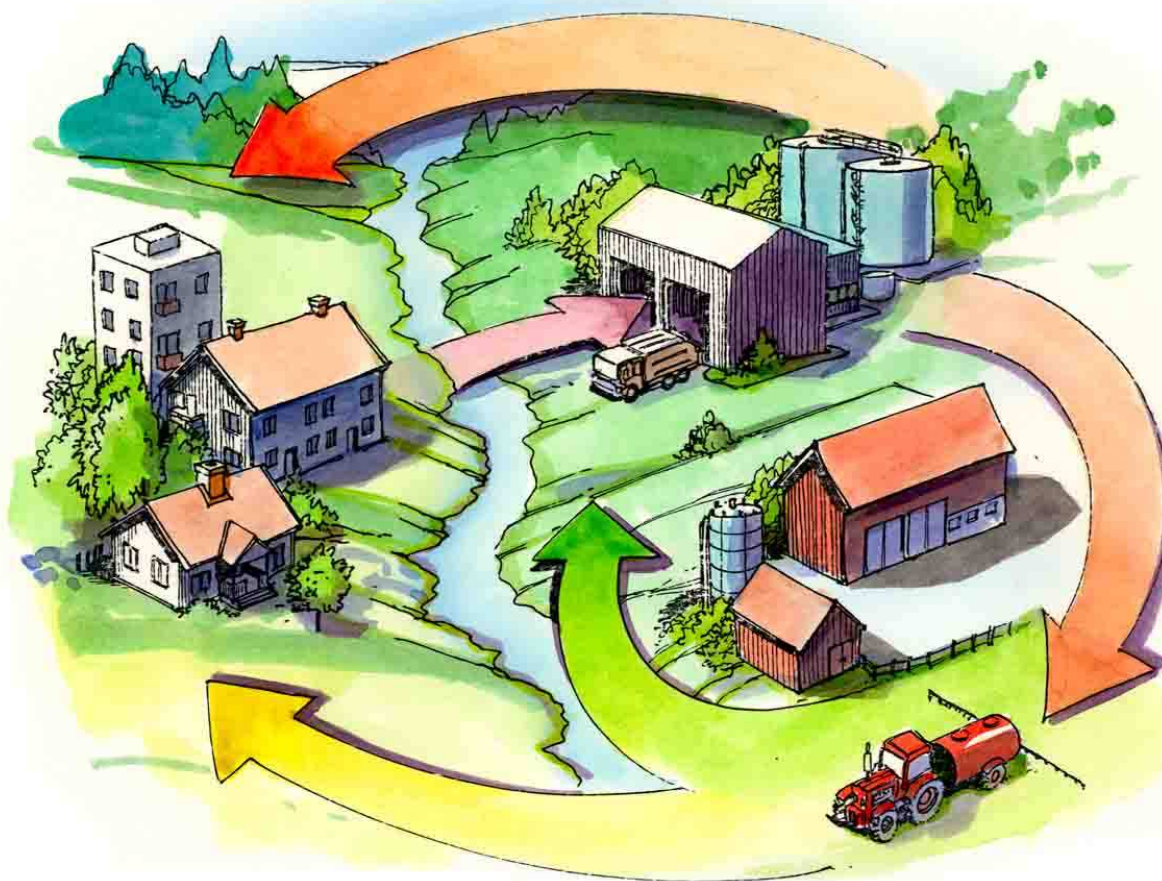
Carl-Magnus Pettersson

## The Växtkraft Project

The City of Västerås,  
The County of Västmanland



## Vehicle fuel and bio-fertilizer from bio-waste and agricultural crops - the “Växtkraft-concept”



## The Växtkraft Project

- ✓ **Biogas plant for production of biogas and of bio-fertilizer**
- ✓ **Plant for upgrading biogas**
- ✓ **Filling stations for buses and cars**
- ✓ **Filling station for mobile gas containers**
- ✓ **Gas pipelines**
- ✓ **Silage storage at the biogas plant**
- ✓ **Satellite storages for liquid bio fertilizer**

## The Växtkraft Company Owners



65.0 %



32.5 %

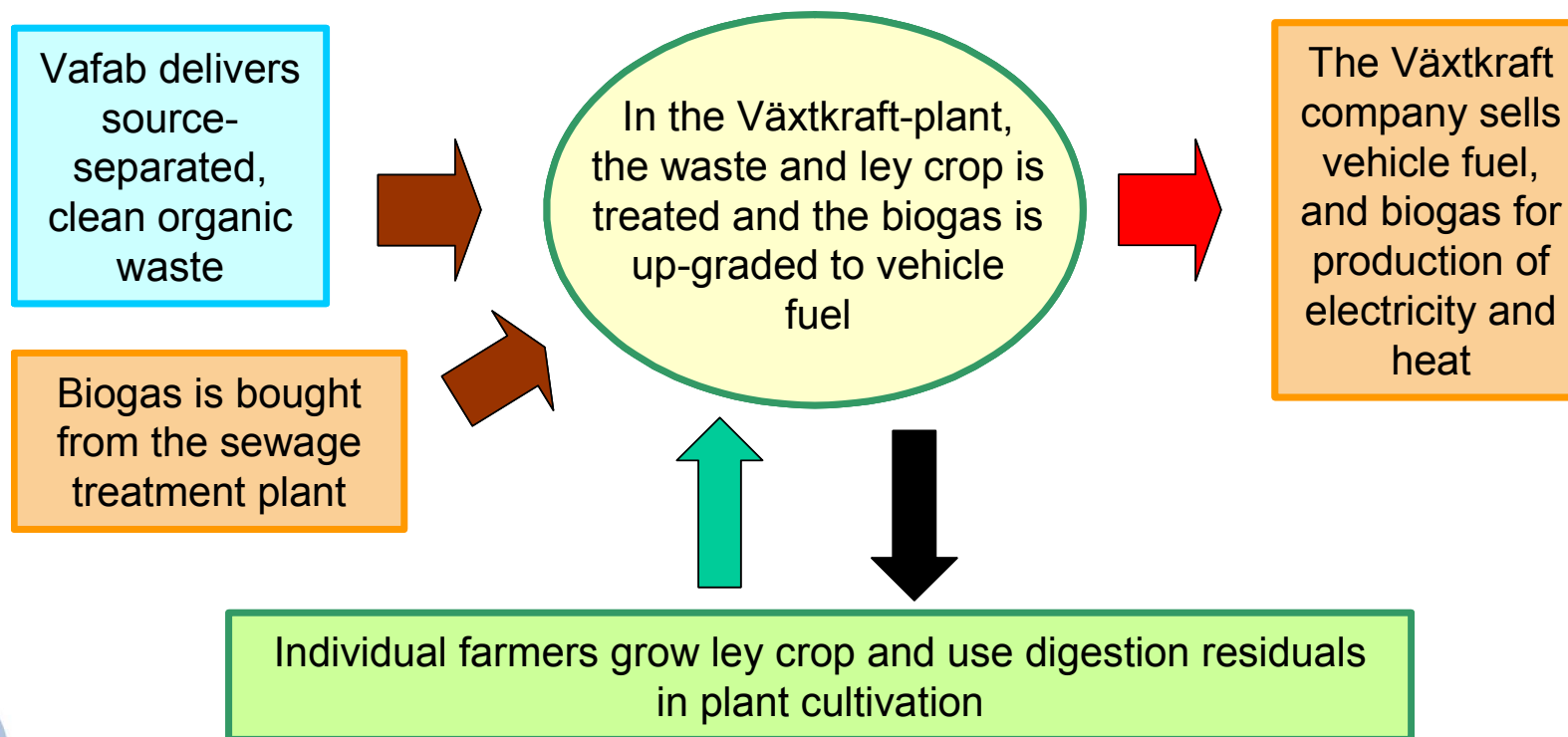
Three farmers

2.5 %





## Overall Process Flow



## Some Key Data

### Input

n Organic Waste:	15 500 t/a
n Grease Trap Removal Sludge:	2 000 t/a
n Ley Crop (Silage):	4 000 t/a
n Biogas from Sewage Treatment Plant:	8 GWh/a

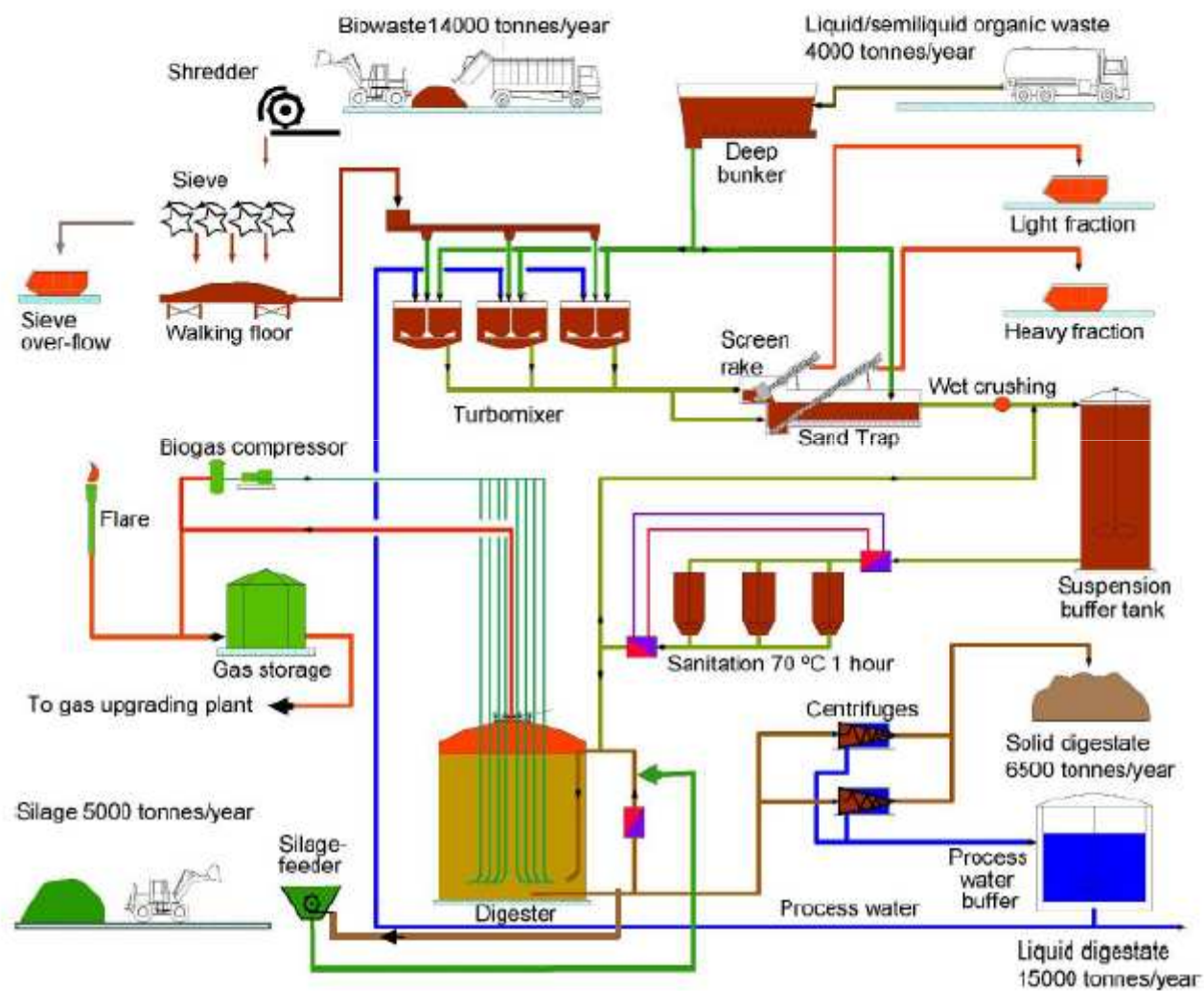
### Output

n Solid Digestate:	4 000 t/a
n Liquid Digestate:	18 000 t/a
n Purified biogas:	27 GWh/a
(Equivalent to 3,0 million liters of diesel/petrol)	



## Bio-waste - Open ventilated system







## The Biogas Plant



## Cultivation of Ley Crops

- ✓ **Two- three year ley crop with high amount of red clover**
- ✓ **Replaces cereal crops (wheat, barley etc)**
- ✓ **Växtkraft supply seeds – the farmer establish the ley crop**
- ✓ **The crop is harvested by Svensk Växtkraft**
- ✓ **Harvests two times a year**
- ✓ **Economical equivalent to cereal crops**

## Handling of Ley Crops for Biogas Production





## Handling of Silage





## Production of bio-fertilizer

- ✓ **The bio-fertilizer is approved for the use in organic farming**
- ✓ **Two forms: one solid and one liquid. The solid is mainly used as a phosphorus-fertilizer and the liquid as a nitrogen-fertilizer**
- ✓ **The price is set according to the price on the fertilizers it replaces**
- ✓ **Växtkraft transports the bio-fertilizers to storages at the farms**

## Transportation of solid bio fertilizer

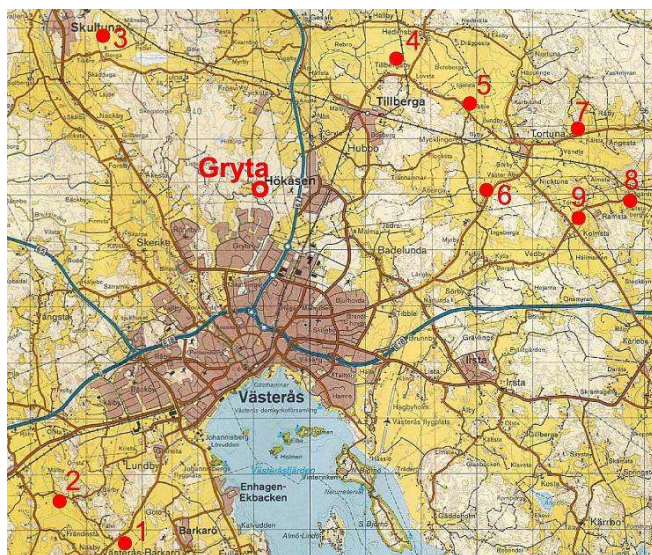


## Transportation of liquid bio fertilizer





## Satellite storages for liquid bio fertilizer

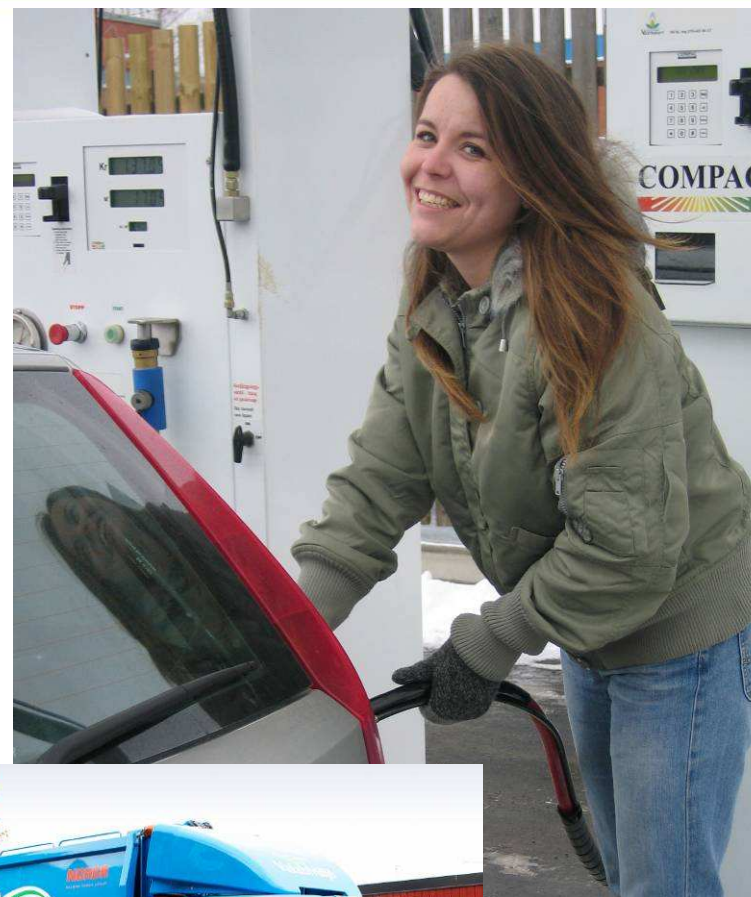




## Spreading of liquid bio-fertilizer



The biogas is used as fuel for cars, buses, refuse collection trucks etc





## The overall gas handling system



Biogas plant for production of biogas from waste and agricultural crops

Plant for up-  
grading biogas  
to vehicle fuel  
quality



Filling station for movable gas storages for the supply of biogas to public filling stations



Public filling station for cars and other vehicles



Gas storage divided into three sections. Maximum pressure 350 bar and capacity app. 6000 Nm<sup>3</sup>



Fast filling station for 40 buses and 12 refuse collecting vehicles



Pressure station at the sewage treatment plant



LNG storage (liquefied natural gas) to be used as a back up for biogas



Two high pressure compressors with 100% redundancy

Public filling station for cars and other vehicles



## Filling station for mobile gas containers





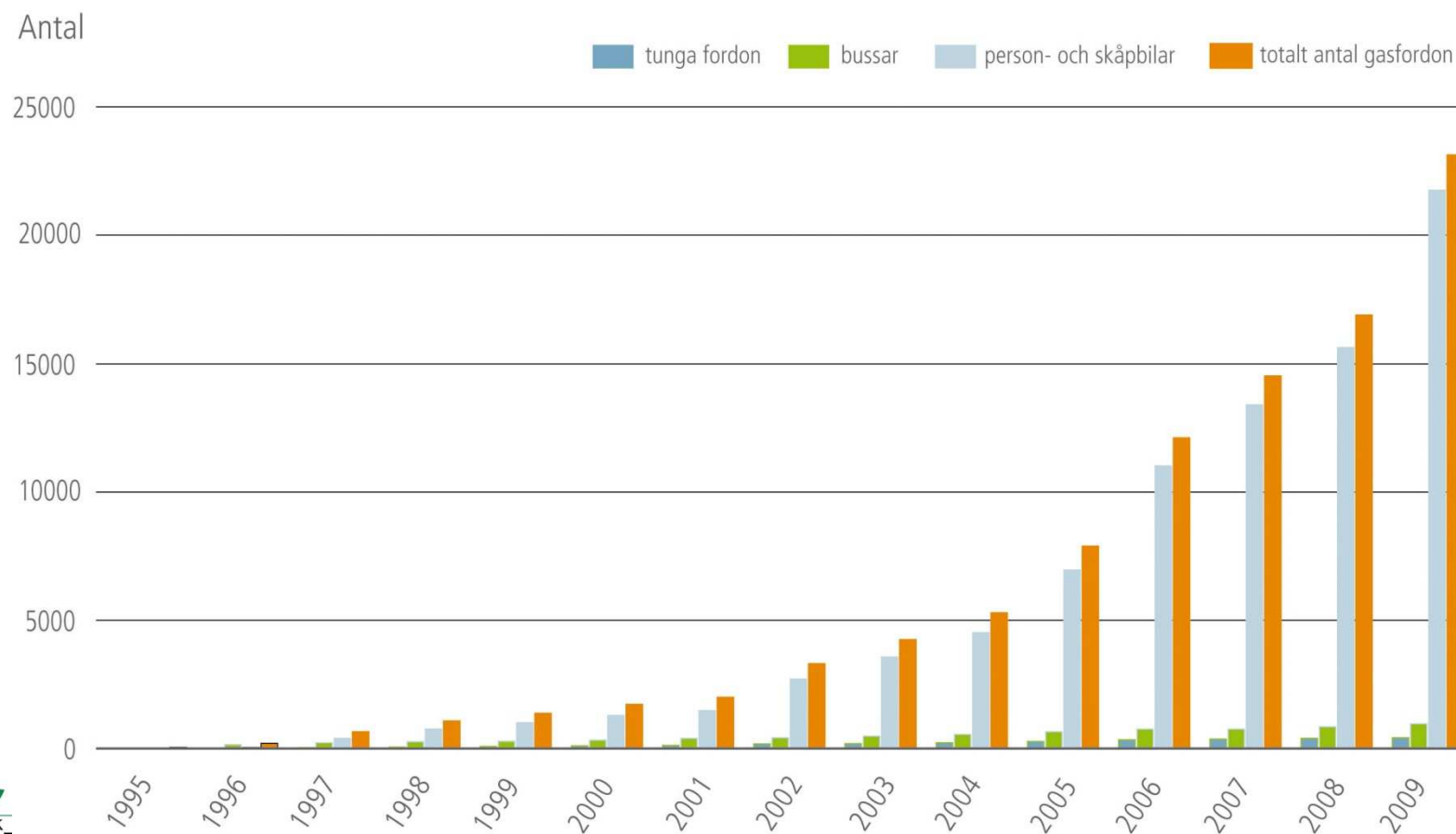
## The second filling station in Västerås



## Achievements so far:

- ✓ **Delivery of biogas to buses and cars since October 2004**
- ✓ **Delivery of biogas to public filling stations in Stockholm since 2008**
- ✓ **Treatment of bio-waste since July 2005**
- ✓ **Using ley crop (silage) for biogas production since 2007**
- ✓ **Farmers uses the bio fertilizer since 2006**

## Biogas/CNG vehicles in Sweden 1995 - 2009



## Expected development:

- ✓ **Continued increase of the selling of biogas to cars at the public market**
- ✓ **Increased number of buses operated on biogas in the county of Västmanland. From 40 buses today to all 140 in 2020**
- ✓ **Increased production of biogas to meet the market demand**



More info:

[www.vafabmiljo.se](http://www.vafabmiljo.se)

(follow link to Svensk Växtkraft)

[www.biogasmax.eu](http://www.biogasmax.eu)