TU Delft

Delft University of Technology

# Agricultural Platforms

Muñoz Sanz, Victor; Kuijpers, Marten; Jaoude, Grace Abou

**Publication date**
2018

**Document Version**
Final published version

**Published in**
Harvard Design Magazine

**Citation (APA)**
Muñoz Sanz, V., Kuijpers, M., & Jaoude, G. A. (2018). Agricultural Platforms. *Harvard Design Magazine*, (No. 46 F/W 2018 No Sweat), 124-131.

**Important note**
To cite this publication, please use the final published version (if applicable).
Please check the document version above.

**Copyright**
Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

**Takedown policy**
Please contact us and provide details if you believe this document breaches copyrights.
We will remove access to the work immediately and investigate your claim.

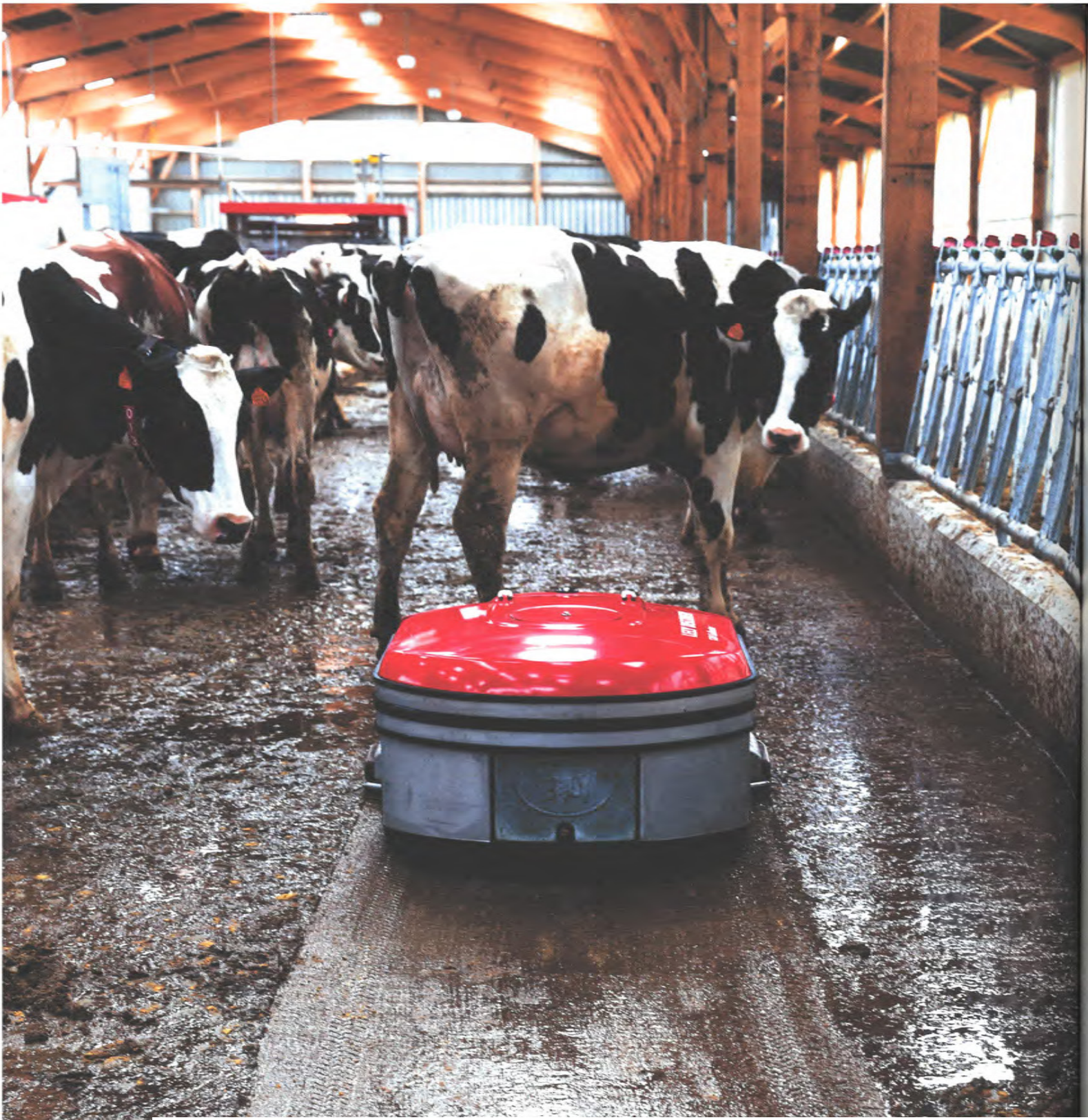
*This work is downloaded from Delft University of Technology.*
*For technical reasons the number of authors shown on this cover page is limited to a maximum of 10.*

*Green Open Access added to TU Delft Institutional Repository*

*'You share, we take care!' - Taverne project*

*https://www.openaccess.nl/en/you-share-we-take-care*

Otherwise as indicated in the copyright section: the publisher is the copyright holder of this work and the author uses the Dutch legislation to make this work public.



Víctor Muñoz Sanz, Marten Kuijpers, and Grace Abou Jaoude, "Agricultural Platforms," in Harvard Design Magazine, number 46 "No Sweat", winter 2018, 124-131.

# Agricultural Platforms

Víctor Muñoz Sanz,
Marten Kuijpers &
Grace Abou Jaoude

Numbers 60 and 82 are standing on a nondescript grass field under the sun in the eastern Dutch province of Overijssel. We know their identification numbers because they appear in large, contrasting bold white type on their black-and-red collars. The others remain inside the brand-new Cow Lounge, but 60 and 82 have just been milked, so the gate determined that they are free to roam. Soon they will reenter the Astronaut—the milking robot. Their collars are not leather strips with traditional iron cowbells, used to locate and identify livestock, but wearables, mounted with units packed with sensors that feed automated systems with performance-calibrated data.[1]

A few years back, in March 2011, a Google Street View car was on duty, documenting the rural roads just north of where we would eventually meet the two even-numbered ruminants. As it passed by a dairy farm on the Koloniedijk, its nine cameras recorded a construction site in the backyard, with dozens of curved galvanized steel frames—meant to become cow cubicles and fences—piled up on the freshly flattened ground. Google's candid camera also caught a van from Lely—a Dutch dairy farming automation company—near the parking area adjacent to the existing barn. Ultimately, a new, bigger barn would be built to host 190 cows, well above the average number of cattle per farm in the country.[2]

The algorithmically controlled traffic of collared cows in the midst of industrial-scale barns is becoming an increasingly common sight in the mosaic of green strips that is the Dutch polders.[3] But while the romantic, archetypal landscape of the polder land may appear untouched to the distracted eye, the mere presence of the collar evidences long, deep processes of transformation that extend across diverse agricultural sectors and their production spaces. With efficiency, ingenuity, corporate interest, finance, and government policies as the main drivers, the architecture of farms and greenhouses, patterns of land ownership and consumption, and the spatial organization and management of human and nonhuman labor are being reinvented by automation technologies.

## Accommodating the Milkmaids of Today

In the Netherlands, milking is as connected with cows as it is with the voluptuous body of Vermeer's *Milkmaid* (ca. 1657–1658) and the farm stories of love and life that the scene suggests. Today, milking fortunes and misfortunes are not hidden behind the tall windows of a canal house in Delft, but underneath the curvy and glossy, lipstick-red chassis of Lely's robots. Lely's headquarters in Maassluis are not far from where Vermeer once lived. Founded in 1948, Lely has become the global leader in dairy farming automation, in terms of both software and hardware; in fact, it invented the milking robot in 1992.

The company offers clients a complete industrial platform—that is, not only robots but also the infrastructure to mediate between them, humans, and cows. This

1 The crafting of iron cowbells in Portugal was declared as "intangible cultural heritage" by UNESCO due to the risk of its disappearance, as "New grazing methods have largely obviated the need for shepherds and cowbells are increasingly made using cheaper industrial techniques." However, in Germany, animal rights activists want them banned. "Manufacture of Cowbells," UNESCO Intangible Heritage, https://ich.unesco.org/en/USL/manufacture-of-cowbells-01065; "Bavaria Fights Activist Assault on Cow Bells," *Local DE*, August 24, 2015, https://www.thelocal.de/20150824/bavaria-fights-activist-assault-on-cow-bells.

2 The average number of cows per farm was 92 in 2016. "Historie," Van Spijker Stalinrichting, https://www.vanspijkerstalinrichting.nl/historie/; "Bedrijven en dieren," Agrimatie, Wageningen University & Research, June 6, 2017, https://www.agrimatie.nl/SectorResultaat.aspx?subpubID=2232&sectorID=2245&themaID=2286.

3 As of July 2018, 23 percent of Dutch dairy farms use automated milking systems. "Statistiek," Stichting KOM, http://www.stichtingkom.nl/index.php/stichting_kom/category/statistiek.

ecosystem includes the aforementioned milking robot, Astronaut—its best seller, with 20,000 units installed in 2014—self-guided barn cleaners, automated kitchen and feeding systems, feed pushers, robotic fencers, and cow traffic control tools, among other devices. The Lely Qwes, the collar's commercial name, is, next to the cow itself, the most important piece in the system. It identifies and geolocates each animal, while measuring its activity, eating time, and rumination activity. The collar communicates with the robots and literally makes them work. Data from the collars and robots is sent to Time for Cows (T4C), Lely's digital farm management software, and is presented to the farmer through a desktop or smartphone app. The complete hardware and software platform can be accessed through a financing and leasing scheme, which allows dairy farmers to adopt the system via a monthly subscription fee that covers the equipment costs, maintenance, delivery, and insurance—thus safeguarding the farm "against obsolescence."[4]

More importantly, Lely's agricultural platform includes the spatial organization and design of the farm itself. "The barn is a system; management decisions, constraints and barn components should be seen as a whole," reads the brochure *Barn Design for Robotic Milking*, which is part of the company's Farm Management publication series.[5] After some light advice about contextual integration and legislation, the document goes on to discuss issues such as farm layout and cow housing. It addresses the basic spatial requirements necessary for the robotic systems to perform efficiently, as well as those needed to maintain the welfare and productivity of the cows. Recommendations, backed by scientific research, concerning the dimensions of and materials for the animals' lying areas, bedding, flooring, barn ventilation, and lighting are integrated with suggestions regarding the location of the milking robots, passageways, automated fences, and the control room. Lely also connects farmers with trusted spatial advisers and builders. With this spatial advice, the company argues that it is helping farmers to design a highly controlled but emancipatory space for cows, where their "five freedoms"—freedom from hunger, from discomfort, from pain, from stress, and to express their natural behavior—can be fulfilled. At the same time, by introducing the robotic milking barn, the company invites progressive farmers to build their productive space anew, guaranteeing its reproduction by replicating the perfect habitat for its products to thrive.[6]

### *Het Nieuwe Herenboer*, or the New Gentleman Farmer

The *herenboer* was once a familiar figure in several regions of the Netherlands. Between 1760 and 1880, the term denoted a farmer who was also a big landowner, did not directly work his land, and hired laborers. Influenced by the Enlightenment, herenboeren believed in progress and organized their farms according to ideas of order, rationality, and innovation. For them, knowledge produced useful science that informed their estate management. While their monumental residences reminded country people of their enterprising spirit and middle-class ambitions, their alleged materialism and lack of social awareness ended up creating class antagonism. Challenged by the emancipation of smaller farmers, the progressive attitudes of the herenboeren faded and entered into a long period of decline that extended until the 1950s.[7] Yet, today, the shift in the profile of farmers, afforded by automation technologies, suggests the emergence of a renewed version of this long-forgotten character.

"Do I want to be in the milking pit all my life?" wondered Peter Gille in 2010 when considering revamping his farm and purchasing a milking robot. The history of his business, Boerderij Het Lansingerland, goes back to the times of Gille's great-grandfather and his 15 cows. Today, with the help of two milking robots, an automated kitchen, a feeding robot—it saves an average of eight hours a week, claims Lely—and a manure cleaner, one employee manages 110 cows.[8] What is more, automation and the free time it entails have allowed him to expand his business operations and still keep regular working hours: in peak season, he has 40 employees who work on the farm variously running a day care for children, a care farm for disabled people, a shop, a catering business, a wedding and event rental space, and a campsite. In fact, the dairy farm itself makes up just 10 percent of the company's revenue.

4 "Lease goedkoper dan bank," Agrio Meelkvee, ca. 2015, https://www.melkvee.nl/artikel/74582-lease-goedkoper-dan-bank/.

5 *Barn Design for Robotic Milking* (Maassluis: Lely, 2010), https://www.lely.com/media/filer_public/0e/fd/0efd2985-1aaf-4eb4-98dc-530fb3ce5b45/stallenbouw_en_20-05-10.pdf.

6 During our exchange with dairy farmers Marc Havermans, owner of the dairy farm De Klaverhof (personal interview, July 12, 2018) and Marcel Veurink, owner of Melkveebedrijf Veurink (e-mail communication, July 12, 2018), they explained to us that one of the main challenges in introducing automated systems is their spatial integration in a conventional barn. "You have to start all over again. It is not a question of adding fences in the barn. It is totally different," Havermans stated. For this essay, we interviewed six people in the dairy and horticultural businesses: Peter Gille, owner of Boerderij Het Lansingerland (personal interview, July 10, 2018); Marc Havermans; Sjors van der Helm, financial advisor for greenhouse horticulture, bQurious/Schenkeveld Tomaten (personal interview, July 19, 2018); Robert Stolker, breeder at Deliflor Chrysanten BV (e-mail communication, July 20, 2018); Eduard ter Laak, owner of Ter Laak Orchids (e-mail communication, July 10 and 23, 2018); and Marcel Veurink. All quotes throughout the text come from these interviews unless otherwise noted.

7 For more on this historical stereotype, see Ijnte Botke, "Boer en heer. 'De Groninger boer' 1760–1960" (PhD diss., University of Groningen, 2002).

8 Based on our conversations with farmers, we estimate that at least two people working full-time would be needed to run an automated dairy farm with 100 cows. In comparison, according to Marc Havermans, his neighbors—two brothers who own 200 cows and do not use automation—work full-time, 10 hours a day, seven days a week, and hire two additional employees. Havermans has 270 cows and works 10.5 hours a day, but his farm employs a wider range of machines than that of Gille: five milking robots, an automated kitchen and feeding system formed by five robots, a self-guided barn cleaner, and two automated gates.

ABOVE
Lely Astronaut A2, Maassluis, 1997.

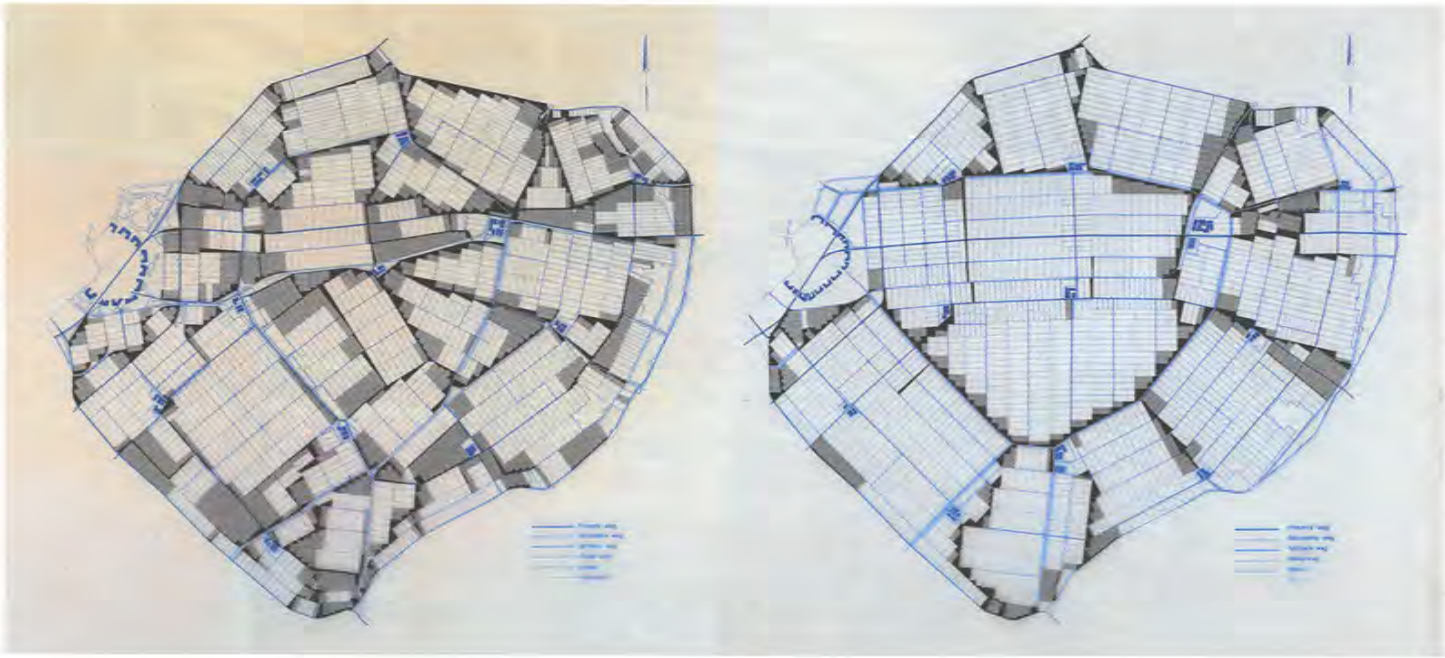
Beyond the specifics of each sector, the implications of automation for the lifestyle of farmers in dairy and greenhouse horticultural production, in particular, have much in common: sensors, computers, and robots make work more flexible and lighter, opening up the possibility of having "normal" workdays and holidays; the time that is freed up allows owners to scale up operations while hiring fewer employees; and these tech-savvy farmers have trust in the machine and use data to make production more efficient. As a result, farmers become managers able to solve problems off-site, sitting behind a computer or on their cell phones.[9] As Sjors van der Helm, a financial consultant in the horticulture sector, stated, "roles have changed"; more time and less labor make the grower more of an entrepreneur, with different skills in technology and management.

If the old-time herenboeren employed laborers to work on their land, contemporary agricultural entrepreneurs put their trust in technology, machines, and software to carry out the toil. Indeed, the dominant rationale among business owners for introducing automated platforms seems to be that of cutting costs on labor. Automation facilitates the replacement of unskilled workers performing repetitive, labor-intensive operations. In turn, dairy farmers have to go through training to become *robotboers*, and greenhouses hire fewer—but highly skilled and adaptable—employees.

However, finding and attracting these post-agricultural workers is not easy. In the Netherlands, working in agriculture still holds a social stigma, as it is traditionally associated with low-skilled jobs, and the sector is the object of severe criticism for its environmental footprint—especially regarding water and energy consumption in greenhouse horticulture, water contamination, and animal welfare in livestock farming. Hence, in contrast to their predecessors, contemporary herenboeren must work to maintain their reputations.

As for the remaining physical human and nonhuman labor needed to keep agricultural automaton in motion, the farmer, now also manager, can easily monitor it through a digital platform. If in an automated dairy farm the collar-mounted sensors enable access to real-time information about each cow's location, health, and activity, in an automated greenhouse a combination of radio-frequency

9 Smartphone apps by Lely (for dairy) and Priva (for horticulture) allow for the complete control of the operations in a farm and a greenhouse, respectively.



ABOVE, LEFT
Drawing with which Mansholt's employees analyzed the proposed plan for Oostelijk Flevoland with (too) many curved roads and irregularities, ca. 1950.

ABOVE, RIGHT
Drawing that shows an alternative proposal by Mansholt's team, in which roads and waterways are straightened to avoid too many irregular parcels, ca. 1950.

identification tagging and data analysis software measures low-skilled employees' productivity and work quality. Action can be taken in view of the results the system displays. Data tells dairy farmers when a cow is lower in the social hierarchy,[10] while the smartphone app sends a notification when an animal is possibly ill; automated fences direct them to special zones for cows that need attention or are of a lower ranking, preventing clusters from forming around the milking robot that might disrupt the traffic of the most productive animals. Similarly, labor performance software suites for greenhouse horticulture help managers set goals, distinguish the most efficient harvesters, and identify who is responsible for putting produce of faulty quality in the market or for causing a food security crisis. Productive employees will get bonuses, while the lower-ranking ones most likely will not be rehired in future harvesting seasons.

As was the case with their enlightened forerunners, the present-day farmers' faith in useful knowledge, technology, and invention, including de-leafing robots, mobile milking robots, and milk-delivering drones, helps the farmers reimagine the future of their businesses. However, the race toward a frictionless productive process is not without challenges or conflicts with efficiency. First, the necessary investments are high. Second, elements of uncertainty remain in this assemblage of machines and organic matter; not all activities can be automated, and a cow can hit, or shit on, the robot's sensor and create chaos in the barn. Finally, automation requires the construction of a new productive architecture that is designed for the machines.

## A Great Decoupling in Perspective

The Great Decoupling is one of the most widely circulated concepts used to describe the effects of automation in labor markets. Popularized by MIT professors Erik Brynjolfsson and Andrew McAfee, it refers to a statistical trend that shows that, after decades of positive correlation between productivity growth and employment growth in the United States, job creation began to decouple, decelerate, and lag behind productivity at the beginning of the 2000s.[11] While globalization and policy might partially explain this change, according to Brynjolfsson and McAfee, the opening of "the jaws of the snake" signaled an irreversible shift from investing in labor toward capital—that is, digital and automated labor was replacing human labor.[12] Could the collar-mounted sensors and robots developed for the agricultural sector be indicating a similar phenomenon in the Dutch countryside?

Actually, history shows that these machines stand at the end of a long process of decoupling pushed by policy and technology that began in the 1930s. Perhaps the defining feature in post-World War II Dutch agriculture is its persistent gains

10 Cows are social herd animals and interact to communicate dominance, subordination, and bonding. Research suggests social rank is predicted by age and body weight and size. Cows of higher ranking enter milking robots more often without waiting, increasing queuing times of lower ranked animals. Martin W. Schein and Milton H. Fohrman, "Social Dominance Relationships in a Herd of Dairy Cattle," *British Journal of Animal Behaviour* 3, no. 2 (April 1955): 45–55; V. Reinhardt and A. Reinhardt, "Dynamics of Social Hierarchy in a Dairy Herd," *Zeitschrift für Tierpsychologie* 38, no. 3 (1975): 315–23; C. C. Ketelaar-de Lauwere, S. Devir, J. H. M. Metz, "The Influence of Social Hierarchy on the Time Budget of Cows and Their Visits to an Automatic Milking System," *Applied Animal Behaviour Science* 49, no. 2 (1996): 199–211.

11 A more complete version of the Great Decoupling chart also includes as variables GDP per capita and median income. While GDP continues its trend of growing hand in hand with productivity, median income had already started to decouple from productivity in the 1980s, and it dramatically fell in the 2000s. See Jared Bernstein, "The Challenge of Long Term Job Growth: Two Big Hints," *On the Economy: Jared Bernstein Blog*, June 5, 2011, http://jaredbernsteinblog.com/the-challenge-of-long-term-job-growth-two-big-hints/; Amy Bernstein and Anand Raman, "The Great Decoupling: An Interview with Erik Brynjolfsson and Andrew McAffee," *Harvard Business Review*, June 2015, https://hbr.org/2015/06/the-great-decoupling.

12 Erik Brynjolfsson and Andrew McAfee, "The Great Decoupling," *New Perspectives Quarterly* 30, no. 1 (2013): 61.

in efficiency due to a radical, comprehensive project of modernization. Dutch agriculture, predominantly small-scale and labor-intensive, laid in ruins after the Great Depression, war, and occupation. In a context of scarcity and with the trauma of the 1944–1945 famine still fresh, Sicco Mansholt, the minister of agriculture after the liberation—and a farmer himself—implemented a policy oriented toward increasing production and improving farmers' welfare. These goals were to be achieved by mechanizing and rationalizing production and providing subsidies in the form of guaranteed price rates for produce.

Most importantly, mechanization was an agent defining the physical and social structure of agriculture. To begin with, dealing with the problems of small and scattered parcels, poor infrastructure, and nonviable farms was essential for bringing in machines. Planners, agricultural engineers, and landscape architects conceived several regional improvement schemes, mostly concerning extensive land consolidation projects and new polders. These landscapes were redesigned in line with the long Dutch tradition of land-making—that is, with an economic and utilitarian mindset, farms were placed in regular intervals along a differentiated network of perpendicular roads and ditches, and endless straight lines framed very large parcels meant for the efficient mechanical tilling of the land. In sum, these farms formed a "monumental farmland" of "overwhelming" horizon, as landscape architect Adriaan Geuze described it.[13] Deviations to this ideal were met with explicit repudiation. When assessing the drawings for the eastern section of the Flevoland polder, Mansholt noted how its makers had evidently striven carefully for a degree of romanticism in the polder. "It is clear that this may be a false romanticism," he said, denouncing the curved roads in the plan.[14]

In fact, the transformation of the rural environment Mansholt imagined had to be complete—yet it could not be ruthless. In parallel with the reconfiguration of the landscape, public information campaigns introduced technological and organizational innovations in farms and villages across the country. Mostly taking the form of films, agricultural education and research acted as means for soft social engineering and helped the population fit into its new built environment. More importantly, the shift to a highly productive and mechanized countryside and the elimination of redundant operations came with the assumption of a reduction in agricultural employment. Hence, it was paired with compensation schemes and the allocation of space in the plans for the industrialization of rural areas and new employment opportunities. In the end, Mansholt's plans were strongly grounded in a desire to eliminate the growing inequality gap between urban and rural populations.

As with many other grand plans that begin with good intentions, the outcome of Mansholt's high modern vision was bittersweet. When enshrined at the level of European policy, the emphasis on maximizing growth by means of technology, rationalization, and guaranteed pricing resulted in a landscape of obscene surplus. Leveling "butter mountains" and draining "milk lakes" could only be done at the expense of smaller farming businesses.[15] Mansholt's focus on exports, foreign aid, restructuring the sector on a continental level, and a system of quotas would clear the path for the rule of industrial-scale agriculture—and would make the Dutch minister-cum-farmer regret his past endeavors.[16]

## Geographies of Diverging Figures

With more cows and more square meters of greenhouses being processed per annual work unit, labor productivity in dairy farming and greenhouse horticulture continues to grow steadily.[17] Not surprisingly, in spite of the unceasing increase in productivity and total output, and as labor costs per working hour remain on the rise, employment continues to decline, becoming more precarious—or flexible, as it is called in statistical publications. Any change in that negative trend seems unlikely, as Dutch agriculture is celebrated for being at the forefront of technological innovation.

Beyond byzantine discussions of job losses and automation, these statistics are producing spatial outcomes that extend beyond the reorganization of management processes and the architecture of barns and greenhouses. Data from

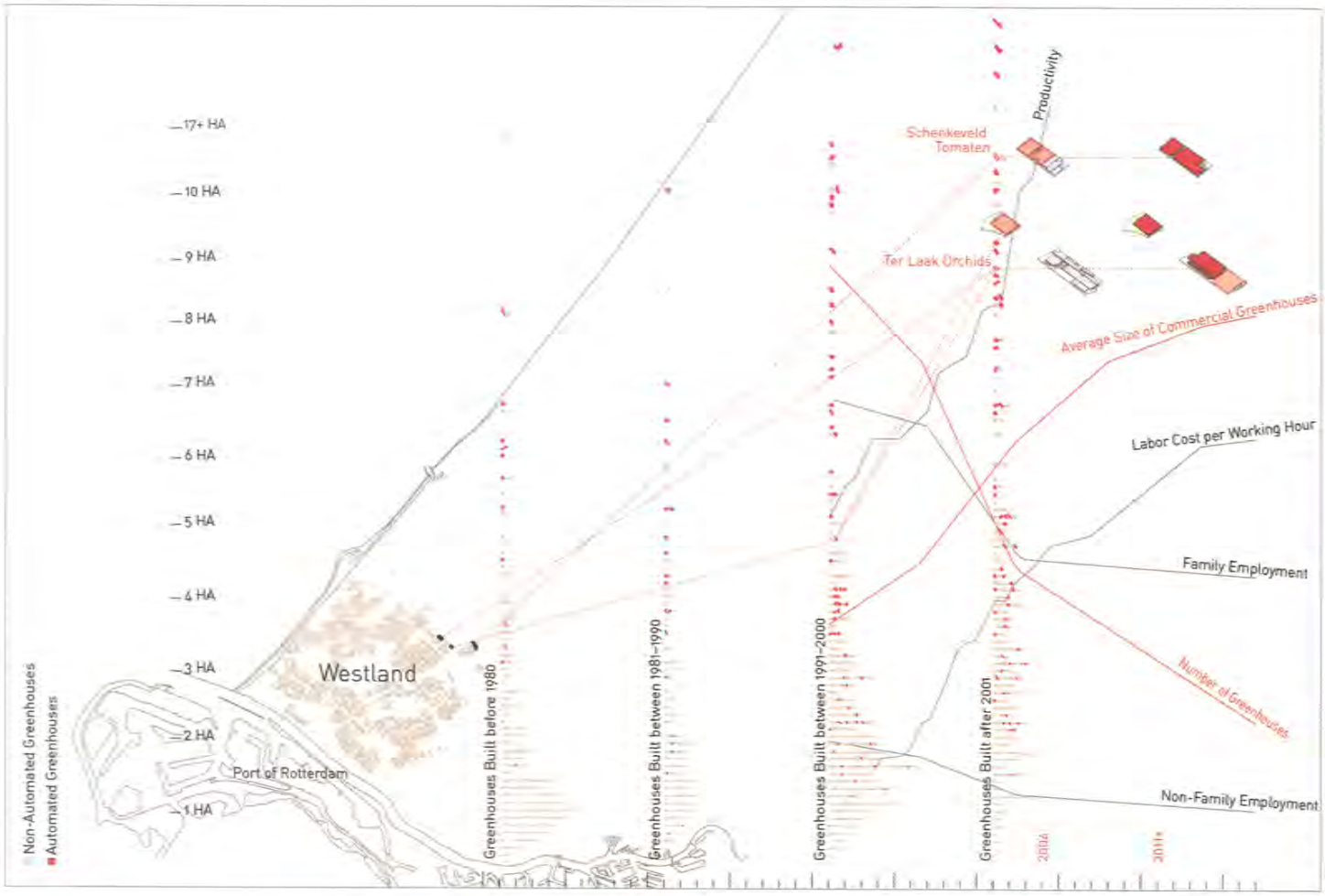
13 Adriaan Geuze, "Flatness," in West 8, *Mosaics* (Basel: Birkhäuser, 2008), 6–20.

14 Sicco Mansholt, "Letter from Mansholt to the planning committee," January 23, 1956, Collectie De Casseres, Het Nieuwe Instituut, CASS 273; translation our own.

15 Beef and butter mountains, and wine and milk lakes were popular hyperboles used to refer to the phenomenon of food overproduction in Europe resulting from policies of modernization and subsidized farming.

16 The exhibition *Sicco Mansholt: A Good European* (curated by Marten Kuijpers, Het Nieuwe Instituut, Rotterdam, August 31–November 9, 2014) followed the rise, fall, and radical change of heart of this politician, as well as the transformation of the postwar Dutch agricultural landscape. See Gerret Andela, "Kneedbaar landschap, kneedbaar volk" (PhD diss., University of Groningen, 2000); and European Commission, *The Common Agricultural Policy: A Story to Be Continued* (Luxembourg: Publications Office of the European Union, 2012), http://ec.europa.eu/agriculture/50-years-of-cap/files/history/history_book_lr_en.pdf.

17 According to Eurostat, "one annual work unit . . . corresponds to the work performed by one person who is occupied on an agricultural holding on a full-time basis." "Glossary: Annual Work Unit (AWU)," Eurostat, http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Annual_work_unit_(AWU).




ABOVE
Trends in greenhouse size and statistics and parcel consolidation.

Agrimatie, a platform of Wageningen Economic Research, and the agricultural census of Statistics Netherlands, shows a correlation between the growth of productivity and the growth of the average production site size. Larger individual farm size also coincides with an increasing concentration of capital and a weakening of competition, as the number of businesses in greenhouse horticulture and dairy farming is in steep decline. Some figures can help illustrate the scope of the phenomenon as it has occurred between the year 2000 and today. The surface of the average Dutch greenhouse is now 2.5 times bigger, and the number of horticultural companies has been reduced by two-thirds. Similarly, the number of cows in the average dairy farm has almost doubled, from 51 to 97, the average dairy farm's area is one and a half times larger, and a third of the companies in the dairy sector have ceased to exist in this period.

It should be noted that European and Dutch policies make the situation more complex. On the one hand, the combination of the abolition of the European milk production quotas—which aimed to eliminate milk lakes—with the subsequent legislation on phosphate and manure processing has fueled growth and is promoting larger "land-based" dairy farms.[18] On the other hand, regional strategy visions for Westland, the municipality with the highest concentration of greenhouses, are restructuring the area in order to make it more sustainable in its use of resources and more livable and attractive for highly qualified workers. Nonetheless, within this political context, testimonies and additional data suggest a link between scale, concentration, and automation. Sectoral statistics show continuous growth in dairy farms utilizing automated technologies, while greenhouse horticulture growth remains more elusive.

Alternative research methods, however, were used to construct a picture of the extent of automated technologies in Westland.[19] Looking at the case studies published by automation technologies companies like Logiqs, WPS, Hoogendoorn, or Priva, we mapped greenhouse operations using their products. Furthermore, fieldwork was conducted and Google Earth and Street View were used to identify company names

18 Policy defines land-based farms as those that have enough land to keep and process their manure on-site. Margrethe Vestager, "State Aid SA.46349 (2017/N)—The Netherlands: Introduction of a System of Tradable Phosphate Rights for Dairy Cattle," European Commission, http://ec.europa.eu/competition/state_aid/cases/271733/271733_1994639_153_2.pdf.

19 For a discussion of the methodology for researching spaces of automation see Victor Muñoz Sanz, "Researching Automated Landscapes," in *Work Body Leisure*, eds. Marina Otero Verzier and Nick Axel (Berlin: Hatje Cantz, 2018), 103–11. For an example of the application of this methodology in a case of greenhouse horticulture automation, see Grace Abou Jaoude, "Machinic Utopias, Automated Futures: Scenarios of Potential Automated Futures in Westland" (MA thesis, Delft University of Technology, 2018).

and dig into their websites and social media accounts for information about whether they employed automation technologies. All in all, the gathered data tells us that at least 15 percent of the companies in Westland—30 percent of its total greenhouse area—employ automation technologies. When the data is matched with the year in which the greenhouses were constructed, it becomes clear that the newly built ones tend to be automated and are larger.

What is more, successive satellite imagery reveals that informal processes of land consolidation involving automated operations are occurring throughout the region. Large parcels are scarce; hence, farmers who are expanding their businesses have acquired neighboring greenhouses and plots. Those greenhouses are then either connected through compartments or demolished and rebuilt into larger production units that are then designed for automation. It is clear that automation becomes more profitable as the greenhouse grows in scale. Dairy farmers confirm that scaling up will have to occur if the sector wants to remain competitive in the current policy landscape—and, as dairy farmer Marc Havermans stated, "you need automation for that."

## Designing a Post-Agricultural Milieu

In his seminal 2008 essay, "Flatness," Adriaan Geuze looked with disgust to the shift from "the fine art of land-making" to spatial planning as guiding the future of the Dutch built environment beginning in the 1970s.[20] In his view, the emphasis on policy and labyrinthine procedures has resulted in projects denying a long tradition of integrating landscape making, engineering, technology, and context—the space of the Dutch horizon. Geuze denounced the absence of an integral spatial vision, and the resulting financializing, speculation, and banality that had taken over the countryside.

The transformations in the management and design of entire territories that agricultural platforms are engendering demand a deeper look at contemporary automated landscapes, their builders' and actors' motivations and ambitions, the conditions that make them possible, and their spatial implications. These past and current stories of farmers, animals, workers, governments, and corporations warn us about the potential of automation to reorganize the countryside in an unprecedented manner. They also tell us that, in the end, these changes are not impenetrable and are the result of a coalition of specific actors' interests and good intentions. These transformations were introduced to allow farmers to maintain financially sound businesses and have better lives; to benefit the banks that own farmers' debt; to profit the companies that sell their products; and to meet consumers' demands for lower prices and more sustainable and humane production practices.

But in spite of the fact that the new spatial and institutional arrangements affecting the Dutch countryside are carefully designed, the outcome appears problematic. Patterns of concentration of production and capital are reflected in the megafarms and greenhouses popping up across the Netherlands. On the outside, the spatial quality of these landscapes clash with the wishes and expectations of residents and passersby alike. Inside, human and nonhuman bodies are repositioned in space and the productive processes. To all appearances, the pressure for scaling up and lowering costs has set in motion an accelerated race to the bottom that makes it difficult to imagine turning back.

Nostalgia for bygone heroic times will not be enough to address these new conditions.[21] Only after exploring and engaging with these postagricultural landscapes, the spatial potential of the technologies that make them possible, the unprecedented assemblages of organic and synthetic matter they entail, and the architects behind them will we be able to reformulate the agency of the disciplines dealing with the built environment in terms of their design and underlying policies. Unfolding a myriad of cyborg imaginations where landscape and technology integrate and create conditions for humans and nonhumans to collaborate and carry out creative and life-affirming work is a task that awaits us.

20 Geuze, "Flatness," 18.

21 Nor is the solution to melt the polar ice caps, as Geuze suggests in the conclusion and original Dutch title of "Flatness," "De noodzaak van smeltend poolijs" (The Urgency of Melting Polar Ice).

This essay elaborates on research that was jointly conducted at Het Nieuwe Instituut and the Faculty of Architecture at the Delft University of Technology as part of *Automated Landscapes*, a long-term research initiative on the implications of automation for the built environment, launched in 2017 by Het Nieuwe Instituut. It was presented in the form of an installation in the Dutch Pavilion at the 2018 Venice Architecture Biennale, curated by Marina Otero Verzier. Emma Paola Flores Herrera and Chris Zogopoulos, research assistants at Het Nieuwe Instituut, also contributed to this work. The authors wish to thank the farmers who agreed to be interviewed.

*Victor Muñoz Sanz* is postdoctoral researcher at the Faculty of Architecture at Delft University of Technology (TU Delft). His work examines the notion of workscapes—that is, the architectures and territories of human and nonhuman labor, and the spaces shaped by initiatives and innovations of industrial entrepreneurs. Related work includes his doctoral dissertation, "Networked Utopia: The Architecture and Urbanism of the Bata Shoe Company Satellite Cities," the audio-documentary *Off:Re:Onshore* (2018), and his involvement in *Cities of Making* at TU Delft and *Automated Landscapes* at Het Nieuwe Instituut.

*Marten Kuijpers* is researcher at Het Nieuwe Instituut in Rotterdam. His work concerns the often invisible political and economic forces, scripts, and mechanisms that shape cities and their hinterlands, with a particular interest in land use and ownership. He is part of the research team of *Automated Landscapes*, and he curated the 2015 exhibition *Sicco Mansholt: A Good European*, which examined the spatial implications of postwar agricultural policies in the Netherlands.

*Grace Abou Jaoude* has a master's degree in urbanism from Delft University of Technology, where she completed a thesis on the spatial implications of automation in Dutch horticulture. She was part of the research team of the *Automated Landscapes* project at Het Nieuwe Instituut in Rotterdam. Abou Jaoude also holds a bachelor's degree in landscape architecture from the American University of Beirut.