



Next Level Dutch Greenhouse business in China with AI

Experiences and follow up of the seed money project

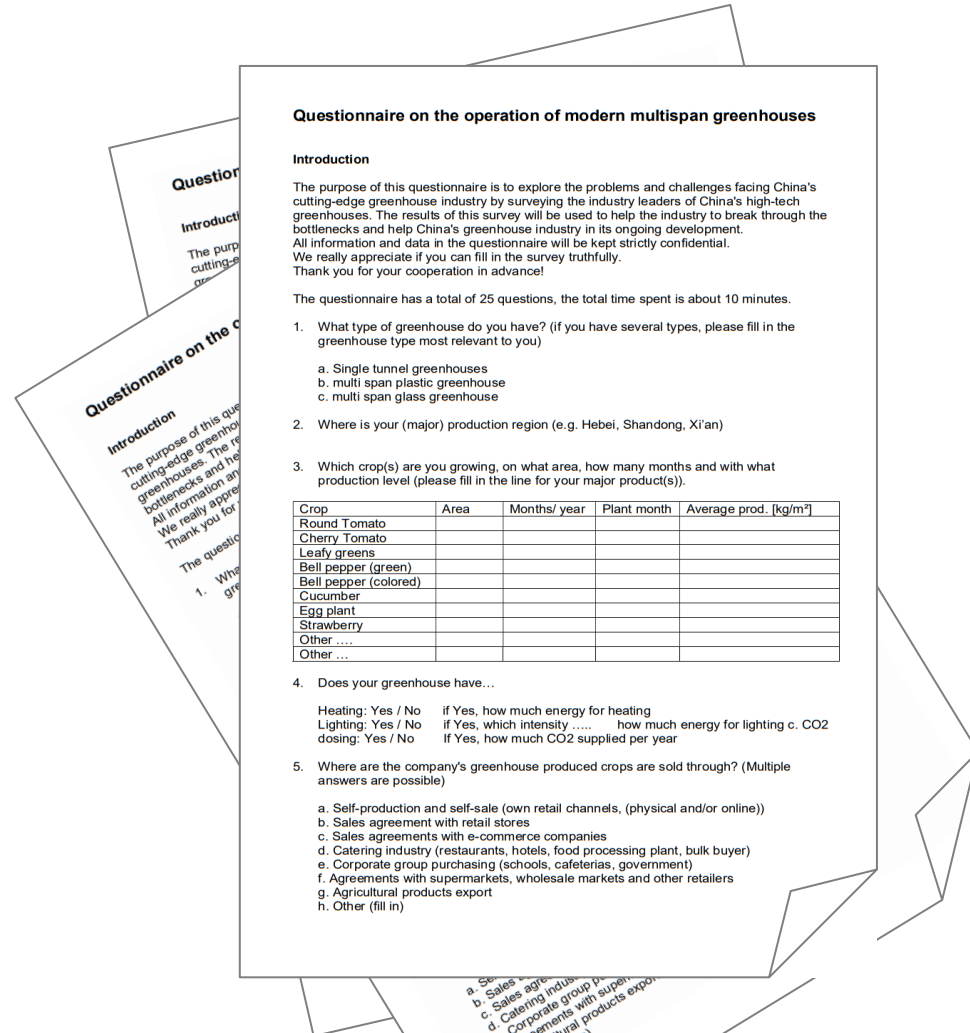
Feije de Zwart¹, Fulco Wijdooge²

2023-12-14



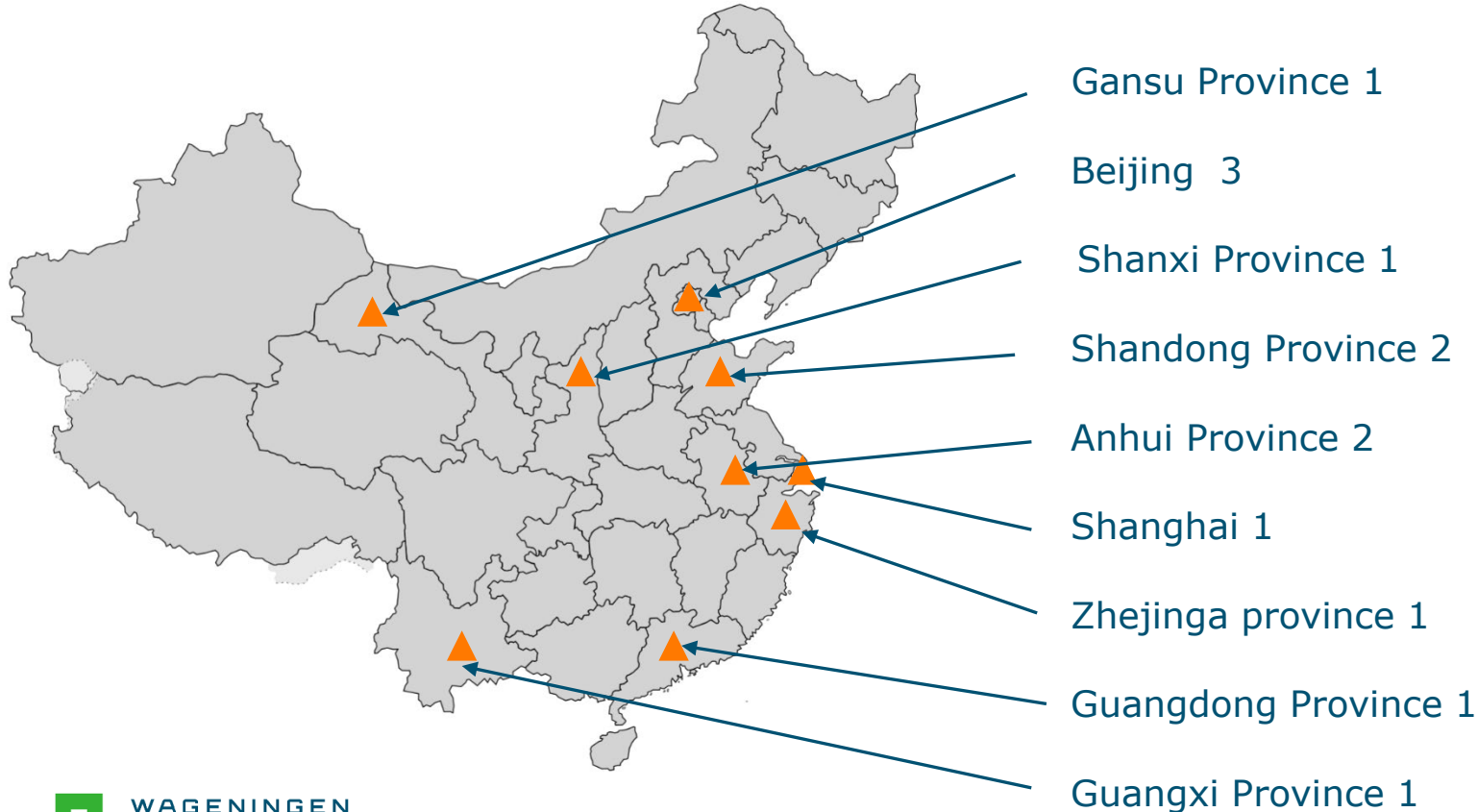
Market Analyses

- Aiming on modern greenhouses
- We used an e-mail list derived from companies that left their registrations at all kind of horticultural knowledge exchange events
- 13 out of 20 responded
- All realizing year round production
- Production levels range between half the amount harvested in the Netherlands until similar levels
- Reported revenue



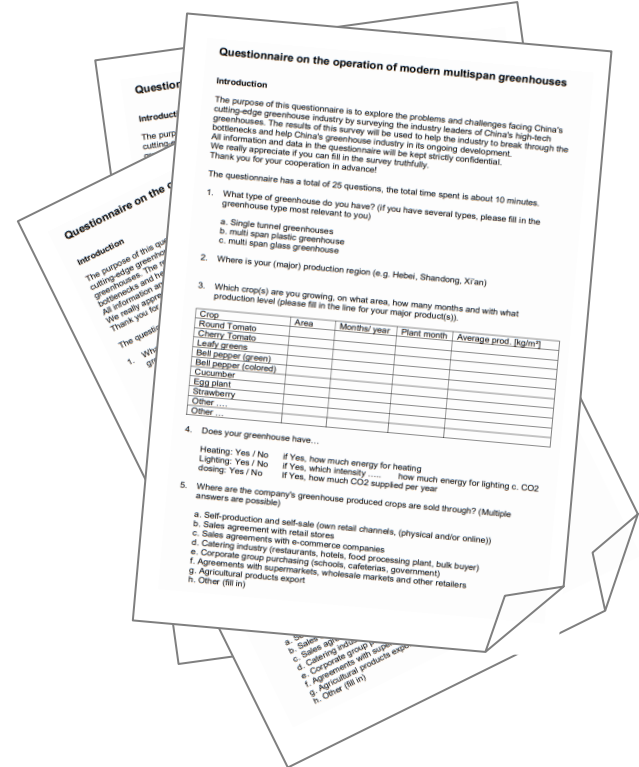
Greenhouse Distribution

Location and number of responses



Results from questionnaire

- All realizing year round production
- Production levels range between half the amount harvested in the Netherlands until similar levels
- Reported turnover ranges from ¥ 200 – 600 (€ 25 – 75 per m2)
- Number 1 problem → finding skilled personnel
- At almost equal level → energy costs
- Surprisingly, pests and diseases are not often mentioned as a problem



Workshops and presentations

Developments and trends in
Greenhouse Horticulture in the Netherlands

Beijing, 27 November 2023

Dr. H.F. de Zwart

Digital Horticulture with Artificial intelligence

Shanghai, 2023-11-28

Dr. H.F. de Zwart

From Sensing to Making Sense

Sino-Dutch Greenhouse Horticulture and Artificial Intelligence Workshop

Pinglin Zhang, 2023 November 30

Results and challenges in AI-driven greenhouses

Dr. H.F. de Zwart
Nanjing, 2023-11-30



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Matchmaking sessions



Workshop in Nanjing

Discussion with audience

Representatives

Supply industry, investor, Academia, Grower



Workshop on Data-assisted Growing (AI in Greenhouses)
数据赋能种植——温室人工智能研讨会

Many growers with modern facilities are confident that the profitability of their greenhouse can be improved by making better use of new data-driven growing techniques. Wageningen Greenhouse Horticulture has gained substantial experience from the three autonomous greenhouse challenges organized in recent years, demonstrating that AI-driven technologies were capable of facilitating the cultivation of vegetable crops with high yields and profitability.

In this workshop, specialists in the field will provide a brief overview of results, perspectives, and challenges related to data-driven horticulture. Additionally, developments in sensor technology will be presented, as sensors serve as the "eyes and fingers" of AI algorithms. After the brief introduction to the topic, the audience is welcome to participate in a panel discussion with experts.

许多拥有现代化设施的种植者深信，通过充分发挥高科技，以数据驱动的方式进行种植，能够有效提升温室农业的生产效益和盈利水平。瓦赫宁根大学温室园艺团队在过去几年中组织的三场智慧温室种植挑战赛中积累了丰富的经验，充分验证了人工智能驱动技术在推动高产、高盈利蔬菜作物种植方面的潜力。

在本次研讨会中，领域专家将概要地概述数据驱动园艺生产的成果、前景和挑战。同时，将介绍传感技术的最新发展，因为传感器被视为人工智能算法的“眼睛和手指”。在主题简介后，欢迎观众积极参与专家组织的圆桌讨论。

Invitation

Venue :Ballroom A, 1st Floor, Xinha Hentique Hotel,
158 Xiangxian Road, Pukou, Nanjing, Jiangsu.

地点：江苏省南京市浦口区象贤路158号南京焜禾通田酒店

Speakers 演讲人：

- Dr. Feije de Zwart, Senior Researcher Greenhouse Horticulture 温室园艺高级研究员
- Ir. Pinglin Zhang, Researcher Data Analyses and Machine Learning 数据分析与机器学习研究员



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Date 日期: November 30th 2023年 11月 30日

Time 时间: 15:40 – 16:40

Contact person 联系人: Bing Guan 关老师 Tel. 电话: +86 13488794283 Email 邮箱: china@wur.nl



Result: Project on structured data collection for DSS model development

- Follow up of production results on a weekly base, send in by HX-personnel
- Continuous flow of greenhouse climate data through the Letsgrow platform
- Finding causal relations between climate (and maybe also other factors) and production
- Developing an automated procedure to select optimal climate controller strategies
- Implement this system on the Ridder climate computer

AGREEMENT

Reference number: 3742347xxx

The undersigned,

1. the foundation **Stichting Wageningen Research**, research institute Wageningen Plant Research, business unit Greenhouse Horticulture, established in Wageningen, the Netherlands, whose registered office is at Droevendaalsesteeg 1, 6708 PB Wageningen, the Netherlands, hereinafter also referred to as: 'WR', lawfully represented by its Director Operations, Dr Ir P.W.J.R. Caessens;

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E-mail address: feije.dezwart@wur.nl
Business Unit: Greenhouse Horticulture

2. **HX-agriculture**, whose business address is at Nijverheidsweg 2, Maarsse, 3606 AJ, the Netherlands, hereinafter also referred to as HX, lawfully represented by Simon Li, CEO;

Contact person: Simon Li
Telephone number: 21752069@qq.com
E-mail address:

hereinafter also referred to individually as 'Party' and collectively as 'Parties';

declare that they have agreed as follows:

1. Brief title of the assignment

Automated data-analyses on climate-crop production relations for Lettuce

2. Plan of approach

HX-agriculture has started a 4.5 ha year round lettuce cultivation greenhouse in Jiashan, China. It is a very modern greenhouse, built at the latest Dutch greenhouse building standards. The lettuce growing system is based on germination and propagation in a completely artificially illuminated and closely controlled stacked indoor facility. When the lettuce plants has reached about 4 cm height, they are transplanted to floaters holding 12 plants with a density of 20 heads per m². From there on, the floaters are automatically placed in a pond-system through which they are pushed to the other side in a period of around three weeks' time. The moving is completely unmanned and only the cutting and packaging of the lettuce requires human labor. The greenhouse is therefore already largely autonomous. Also the climate control and irrigation is automated, except for the definition of setpoint strategies concerning temperature control, humidity control, CO₂-dosing, lighting strategy and EC-control of the water in the ponds. Settings for these control-loops are defined and monitored by the grower.

In order to also automate the definition of the optimal control strategies, clear relations have to be found between greenhouse climate and resulting production. In this project an automated data-analyses procedure will be developed aiming on processing data from the greenhouse in Jiashan in order to find causal relations between greenhouse climate at the one side and Lettuce quality and quantity at the other side.

Once this relation has become clear, and tuned onto the results obtained in the local conditions, the better strategy can be automatically distinguished from the good. This opens the way for an automatic climate controller strategy setting. This brings fully autonomous lettuce production within reach.



Towards autonomous control

Thank you
for your
attention!

Contact:

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HX Agriculture



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