Improving sustainable Chinese pig production by sharing knowledge from the Netherlands

Robert Hoste, Jie Yan
Improving sustainable Chinese pig production by sharing knowledge from the Netherlands

Robert Hoste¹, Jie Yan²

1 Wageningen Economic Research
2 Wageningen Livestock Research

This study was carried out by Wageningen Economic Research and was commissioned and financed by the Dutch Ministry of Agriculture, Nature and Food Quality (project number 2282100453).

Wageningen Economic Research
Wageningen, November 2023
Which knowledge transfer would be helpful for pig production in China to increase sustainability and efficiency, and which ways of knowledge exchange are suitable? An analysis of these questions was performed. Knowledge sharing can be directed towards both large companies and middle-sized family farms. Needs regarding topics and approach differ among both types of farms. A train-the-trainer approach seems suitable for middle management (foremen) and family farm owners, making them ambassadors for further dissemination. Dutch companies have a potential role in knowledge transfer to Chinese trade partners, as the Netherlands is seen as a role model for the Chinese pig industry. Research has been performed on the apparently existing knowledge gap in Chinese pig production, against the background of policy and the societal situation, based on limited literature research and on interviews.

Welke kennisoverdracht kan de varkensproductie in China helpen om duurzamer en efficiënter te produceren, en welke manieren van kennisoverdracht zijn bruikbaar? Deze vragen zijn onderzocht. Kennisoverdracht kan plaatsvinden richting zowel grote ondernemingen als middelgrote familiebedrijven. Behoeften ten aanzien van thema’s en aanpak zijn verschillend tussen beide ondernemingstypen. Een train-de-trainer aanpak lijkt bruikbaar voor het middenmanagement en familiebedrijven, waarbij deze ambassadeurs worden voor verdere kennisverspreiding onder de werknemers. Nederlandse bedrijven hebben, vanuit Nederland als rolmodel, een potentiële rol in de kennisoverdracht naar Chinese handelspartners. Onderzoek is gedaan naar de kennelijke kennisleemte in de Chinese varkensproductie, tegen de achtergrond van de politieke en maatschappelijke situatie. Dit is uitgevoerd op basis van beperkt literatuuronderzoek en van interviews.

Key words: pigs, China, Netherlands, efficiency, sustainability, knowledge

This report can be downloaded for free at https://doi.org/10.18174/640741 or at www.wur.eu/economic-research (under Wageningen Economic Research publications).

© 2023 Wageningen Economic Research
P.O. Box 29703, 2502 LS The Hague, The Netherlands, T +31 (0)70 335 83 30,
E communications.ssg@wur.nl, http://www.wur.eu/economic-research. Wageningen Economic Research is part of Wageningen University & Research.

This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.

© Wageningen Economic Research, part of Stichting Wageningen Research, 2023
The user may reproduce, distribute and share this work and make derivative works from it. Material by third parties which is used in the work and which are subject to intellectual property rights may not be used without prior permission from the relevant third party. The user must attribute the work by stating the name indicated by the author or licensor but may not do this in such a way as to create the impression that the author/licensor endorses the use of the work or the work of the user. The user may not use the work for commercial purposes.

Wageningen Economic Research accepts no liability for any damage resulting from the use of the results of this study or the application of the advice contained in it.


Wageningen Economic Research Report 2023-149 | Project code 2282100453

Cover photo: Shutterstock
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface</td>
<td>5</td>
</tr>
<tr>
<td>Summary</td>
<td>6</td>
</tr>
<tr>
<td>S.1 Main research question</td>
<td>6</td>
</tr>
<tr>
<td>S.2 Message</td>
<td>6</td>
</tr>
<tr>
<td>S.3 Methodology</td>
<td>6</td>
</tr>
<tr>
<td>1 Introduction</td>
<td>7</td>
</tr>
<tr>
<td>1.1 Chinese pig production shows room for efficiency and sustainability improvement</td>
<td>7</td>
</tr>
<tr>
<td>1.2 Dedicated knowledge sharing can contribute to a more sustainable pig production</td>
<td>7</td>
</tr>
<tr>
<td>1.3 Research questions</td>
<td>8</td>
</tr>
<tr>
<td>1.4 Approach and activities</td>
<td>8</td>
</tr>
<tr>
<td>2 Chinese national context</td>
<td>9</td>
</tr>
<tr>
<td>2.1 Cultural and societal context related to knowledge sharing arrangements</td>
<td>9</td>
</tr>
<tr>
<td>2.2 Developments in production and consumption of pig meat</td>
<td>10</td>
</tr>
<tr>
<td>3 Lessons learnt from selected trainings</td>
<td>13</td>
</tr>
<tr>
<td>3.1 Wageningen Pig Class – Tailor-made programmes for Changrong and for DaBeiNong</td>
<td>13</td>
</tr>
<tr>
<td>3.2 Public private partnership project ‘Enhancing the South Korean pig supply chain’</td>
<td>14</td>
</tr>
<tr>
<td>3.3 Wageningen Advanced Agriculture Master classes for pig farmers in South Korea</td>
<td>15</td>
</tr>
<tr>
<td>3.4 Sunjin Master class Antibiotic reduction through hygiene management</td>
<td>16</td>
</tr>
<tr>
<td>3.5 Wageningen Pig Class for Changrong (partial programme)</td>
<td>16</td>
</tr>
<tr>
<td>3.6 General experiences from the training programmes</td>
<td>17</td>
</tr>
<tr>
<td>4 Developing a training concept</td>
<td>19</td>
</tr>
<tr>
<td>4.1 Target audience should be distinguished between companies and family farmers</td>
<td>19</td>
</tr>
<tr>
<td>4.2 Knowledge arrangements</td>
<td>21</td>
</tr>
<tr>
<td>4.3 There are roughly six thematic areas that should be covered in training modules</td>
<td>22</td>
</tr>
<tr>
<td>4.4 Dutch companies have a potential role in knowledge transfer to Chinese pig producers</td>
<td>23</td>
</tr>
<tr>
<td>5 Conclusion and recommendations</td>
<td>24</td>
</tr>
<tr>
<td>Sources and literature</td>
<td>25</td>
</tr>
<tr>
<td>Appendix 1 Interviewees</td>
<td>26</td>
</tr>
<tr>
<td>Appendix 2 Example of training program</td>
<td>27</td>
</tr>
</tbody>
</table>
Preface

The Netherlands and China maintain a trade and investment relationship in the area of modernising and professionalising the pig production supply chain. Aiming to strengthen this relationship, the Dutch Ministry of Agriculture, Nature and Food Quality commissioned several projects in China focusing on knowledge transfer regarding issues on sustainability and efficiency, including topics such as animal health, welfare, nutrition, housing, and economy. In this report a training concept is developed that can be applied to those involved in Chinese pig production.

We want to thank Mr. Pieter Vaandrager of the Ministry of Agriculture, Nature and Food, and Mr. Karel van Bommel, agricultural counsellor at the Netherlands’ Embassy in Beijing, for their support. Also, thanks to all the interviewees for their time and valuable insights.

We trust this report may stimulate an improved knowledge sharing to and within the Chinese pig production sector, and so contribute to a more sustainable and efficient pig production.

Prof.dr.ir. J.G.A.J. (Jack) van der Vorst
Managing Director Social Sciences Group (SSG)
Wageningen University & Research

Ir.O. (Olaf) Hietbrink
Business Unit Manager Wageningen Economic Research
Wageningen University & Research
Summary

S.1 Main research question

Which type of knowledge transfer would be helpful for modern-day pig production in China, and which ways of knowledge exchanges are suitable?

Chinese pig production is less efficient and sustainable than in countries such as the Netherlands. It is assumed that dedicated knowledge sharing could contribute to a more sustainable pig production. Research was performed to get insight into the demand for knowledge sharing, regarding target audience, knowledge arrangements, topics, and the potential role of Dutch companies.

S.2 Message

Knowledge sharing can be directed towards both large companies and middle-sized family farms. When developing a training programme, a distinction should be made in the approach and topics relevant for top management, middle management and workers. The developed training concept is presented in Table S.1.

Table S.1 Training concept, with focus, approach, and topics, per role within the farm

<table>
<thead>
<tr>
<th>Type</th>
<th>Focus</th>
<th>Approach</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrepreneur</td>
<td>Company strategy focus</td>
<td>Tailor-made programme</td>
<td>Value chain cooperation</td>
</tr>
<tr>
<td></td>
<td>System approach</td>
<td></td>
<td>Consumer demands</td>
</tr>
<tr>
<td></td>
<td>Value chain</td>
<td></td>
<td>Sustainability</td>
</tr>
<tr>
<td></td>
<td>Link between farm activities, output, and sales</td>
<td></td>
<td>Functioning of markets</td>
</tr>
<tr>
<td></td>
<td>Long-term thinking</td>
<td></td>
<td>Financial management</td>
</tr>
<tr>
<td>Middle management</td>
<td>Farm process focus</td>
<td>Train-the-trainer</td>
<td>Data-driven farm management</td>
</tr>
<tr>
<td></td>
<td>Management skills</td>
<td>Blend of theory and practice</td>
<td>Farm economy</td>
</tr>
<tr>
<td></td>
<td>Biosecurity concept</td>
<td>Online</td>
<td>Farm comparison</td>
</tr>
<tr>
<td></td>
<td>People management</td>
<td>Preparation</td>
<td>Labour and People management</td>
</tr>
<tr>
<td></td>
<td>Link between strategy and daily practice</td>
<td>Assignments</td>
<td>Plus, Animal and husbandry</td>
</tr>
<tr>
<td></td>
<td>Data-driven management</td>
<td></td>
<td>related topic for Workers (see below)</td>
</tr>
<tr>
<td></td>
<td>Leading by example</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workers</td>
<td>Animal focus</td>
<td>Practical training</td>
<td>Animal health and biosecurity</td>
</tr>
<tr>
<td></td>
<td>Pig life cycle</td>
<td>Limited time per session</td>
<td>Animal behaviour and welfare</td>
</tr>
<tr>
<td></td>
<td>Animal husbandry, behaviour, health, performance</td>
<td>On-farm training</td>
<td>Reproduction</td>
</tr>
<tr>
<td></td>
<td>Standard operating procedures</td>
<td></td>
<td>Nutrition and feeding</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Housing and climate control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Zootechnical performance</td>
</tr>
</tbody>
</table>

Source: Own composition.

S.3 Methodology

An inventory has been made of the existing knowledge gap in Chinese pig production, taking the policy and societal situation, as well as developments in production and consumption into consideration. This was based on literature research and interviews with Chinese and Dutch experts and experiences from recent training activities. Based on the findings of this research an outline of a training programme was developed and three training sessions were conducted in late 2022.
1 Introduction

1.1 Chinese pig production shows room for efficiency and sustainability improvement

China is a large and important country, not only in terms of population, but also in terms of pig meat consumption. To feed its population with sufficient meat, the country has a large number of pigs. With 53 million tonnes, China had about 45% of the worldwide pig production in the year 2021 (FAOStat, no year). Pig production takes place on small backyard farms and family farms, as well as on large-scale highly integrated companies. Compared to production in e.g., Northwest Europe or the US, the production efficiency is low, both in terms of slaughter pigs produced per sow per year, and in feed efficiency (Holtkamp et al., 2023).

Due to outbreaks of African Swine Fever (ASF), the pig stock in 2019 was almost halved. During the recovery phase after this outbreak, governmental policy was focused on developing both large-scale modern integrations (with up to ten thousands of sows and their offspring), and modern family farms (with up to a few thousand sows). On these farms pigs are kept according to modern production standards and under high biosecurity standards.

Also, sustainability is of increasing interest for the Chinese pig sector as a consequence of political goals. Challenges in food safety, environmental protection and to a lesser extent animal welfare are to be dealt with, also against the background of large and growing numbers of critical consumers with purchasing power.

1.2 Dedicated knowledge sharing can contribute to a more sustainable pig production

The Chinese government is willing to support the improvement of the zootechnical efficiency, sustainability and cost-effectiveness of the pig production. Apparently, there are ample opportunities to improve an integrated sustainable production. Government and companies are, in order to reach such goals, looking for insights gained in countries like the Netherlands or Denmark. In this report the focus is on experiences from the Netherlands.

The high zootechnical efficiency in the Netherlands 'can be attributed to regular implementation of innovations and knowledge sharing between pig farmers and between pig farmers and other links in the supply chain', as Van Wagenberg and Hoste (2021) stated. Innovation and knowledge sharing might therefore be helpful in improving the production efficiency and more sustainable production in China. This is supported by interviewees (see Appendix 1), who indicate that Chinese pig production supply chains could benefit from knowledge exchange and technology to be able to meet the policy sustainability goals of the Chinese government.

Currently innovation in Chinese pig production is typically technology-oriented, and especially based on importing technology. Social innovation (related to farmer behaviour and awareness), however, hardly plays a role. The developments in the Dutch pig sector are characterised by a combination of both technological and social innovation and the Chinese pig sector could benefit from this approach.

The Dutch agricultural sector, and more specifically the pig sector, is seen as an example for the Chinese pig industry, as confirmed by the fact that the Dutch initiative of the Research, Test and Training Centre is being welcomed in Anping. There are many business contacts between Dutch companies in the pig industry, and
Chinese trade partners. These contacts are related to genetics, housing equipment, and feed production. Although Dutch companies are focusing on a correct implementation of their products at their customer’s farms, a joint approach of knowledge sharing, in which both technological and social innovation are addressed, is seen as necessary, according to experiences from interviewees. Currently knowledge is shared both from companies to customers as well as by trainings to students.

The main questions in this research relate to the needed knowledge transfer, and the role that Dutch companies can play in this knowledge transfer. This can contribute to a higher level of integrated sustainability in pig meat production in China, as well as a strengthening of the Dutch industries’ position in the Chinese pig industry.

1.3 Research questions

The main question of the analysis is:

What are the characteristics of a potential training programme to improve pig production performance and sustainability in China?

Underlying are the following questions:
1. How does production and consumption of pig meat develop in China?
2. What is the Chinese policy and societal context in which these developments take place?
3. Which challenges does this pose for different topics?
4. What are the characteristics and lessons learnt of other training programmes in Asia?
5. What role can Dutch companies play in this knowledge transfer?

Our research was focused on the primary production, albeit in the light of the entire production chain, and against the background of societal and consumer demands in China.

1.4 Approach and activities

The output of this research is a training programme that has been drafted and validated. To that end, an inventory was made of the knowledge gap of farmers and employees in Chinese pig production, against the background of policy and the societal situation, as well as developments in production and consumption. The gap analysis is based on literature research and interviews. We held 9 semi-structured interviews with experts from China and the Netherlands. We asked them about developments and demands related to pig production in China, as well as about the options and requirements for knowledge transition. Experiences from previous trainings performed in the Asian pig sector were taken into account (see Section 3).

Based on the findings of this research, a training programme was drafted. As a partial validation, three training sessions were held. To that end, the WUR Office in Beijing selected a medium-sized company named Changrong, which initiated a three-year training programme for new employees. The three training sessions were incorporated in their programme. Topics were jointly selected. The training sessions were evaluated. Generally, the training was well appreciated. The content and the interactive lecturing were positively evaluated, especially the topic of integrated biosecurity, being closely related to farm practices. Further details are given in Section 3.5.

Section 2 describes the current situation of the Chinese pig production. Section 3 gives an overview of selected trainings in China and South Korea. An outline of a training programme is described in Section 4. Conclusions and recommendations are given in Section 5.
2 Chinese national context

Chapter 2 describes developments in production and consumption of pig meat (Section 2.1), as well as a general description of the current cultural and societal context in China in relation to pig production (Section 2.2).

2.1 Cultural and societal context related to knowledge sharing arrangements

Knowledge sharing and effective communication in a multi-cultural setting is challenging, although insights into cultural differences can contribute to collaborating successfully. This section describes some cultural characteristics of China, which can be used as a basis to develop a suitable knowledge transfer concept that fits the Chinese circumstances. The cultural background plays a role in every situation, and similar situations are likely found in other Asian countries as well.

The Chinese culture is deeply rooted in the Confucian ethical and philosophical system, which is characterised by a highly collectivistic culture (social relations and embeddedness; Li and Li, 2022; Chen, 2011), a strong hierarchy (Meyer, 2021), and e.g., the concept of ‘learning from the master’ (Hoste et al., 2012), resulting in a typical copying behaviour, as copying a demonstrated success is a safe way to adapt. Face (loss) (e.g., Hu, 1944; Ho, 1976), a sociological concept of reputation, plays a significant role in Chinese culture. In addition, writing skills are highly appreciated, while public speaking is less appreciated. This results in apparent reluctance to participate in public debates, e.g., in a class setting.

Given the strong hierarchic approach, decision-making typically takes place at a higher management level in organisations. This results in a task-oriented focus by employees lower in the organisation, rather than trying to apply new approaches.

Exchanging knowledge as such is popular in Asian countries, if it happens among peers. However, giving feedback is a problem, as negative feedback is related to face loss. WeChat groups are popular, also for farmers to exchange views. They can be used for sending messages, rather than for in-depth discussions.

Demonstration farms are highly appreciated in the Asian culture. Insights are accessible. Students/farmers can look around and ask questions if convenient. Results are trustworthy, since they are shown and underpinned. Trainings on demonstration farms are a good means, as this combines accessibility, personal contact and practical experiences. It matches the cultural copying mindset.

Meaningful/deep communication highly relies on friendship or personal relationships. Sharing insights among farmers in so-called farmer study clubs or peer group training is not very common outside Northwestern Europe. Interviewees indicate that study clubs are not a very effective way of knowledge sharing among Chinese farmers, and this is supported by Van Wagenberg et al. (2021) and Lans et al. (2022).

Hu (2012) points to the belief of China’s leaders in the major role of agricultural technology (tangible solutions) to provide a solution to the nation’s food security concerns. This focus on hardware, and less on farmers’ awareness and management, is also found in our trainings (Section 3).

Chinese pig farmers could benefit from a more integrative problem-solving approach

Interviewees indicated that farmers in China tend towards a single-issue approach and way of thinking, rather than a more integrative way (this is likely not limited to Chinese farmers). Trade-offs of specific adaptations in one area on another area elsewhere in the company/farm, or on a different topic, are not well considered. An example was given of an employee who did not observe a broken water nipple and wondered...
why pigs in the pen were behaving differently. Another example was given of a visitor to a large pig farm, who despite being quarantined (as a common measure before entering the stables to prevent infections), had lunch in the very same canteen as where the employees came for their lunch break. The concept of quarantining was broken, apparently without being noticed. According to interviewees these examples are applicable to similar situations.

Based on Joy and Kolb (2009) it can be concluded that Chinese students have a more abstract learning style than European students. The education system in China is characterised by a strong focus on memorising and reproducing facts, rather than on problem solving and tackling complex problems. According to the interviewees, Chinese farmers tend to approach problems as single issues. Integrated approach and interconnectedness of elements is not very common. E.g., the relationship between risk on antimicrobial resistance for farms on one hand, and the final product for consumption on the other, is hardly understood.

In addition, making mistakes in a learning process is perceived undesirable in China. In larger groups, students might tend to stay silent, so as not give wrong answers. It would be helpful to create a safe environment with mutual trust where learning is stimulated. This can be achieved by a combination of group training, and time for bilateral interactions between student and trainer.

**Data collection only makes sense for farm management if data is being analysed and subsequent actions are taken**

Efficient data management should be based on management by exception: focusing on looking for exceptions in data patterns. This requires efficient evaluation of the right indicators, by using graphics and concise data overviews. To this end, software tools are necessary, as well as the right understanding of the coherence of actions, key performance indicators, and potential management pitfalls. In the interviews, it was mentioned that lots of data are being collected on Chinese farms, but outcomes of data analysis do not always end up with operational management. Although data collection is generally subject to fraud risk if the collector has an interest in it, this is even more the case when data are judged by others, either in the organisation, or from peers, and a reputation is at stake. The advantages of correct data collection and application should therefore be proven in trainings.

In class meetings, elderly and higher ranked people do the speaking and discussing, rather than juniors. However, putting questions is then not very common, as seniors are assumed to know already a lot more than juniors. Therefore, it is advisable to have juniors in a separate training class from experienced people. Moreover, those who are better in speaking English have an advantage and will easier participate in discussions in an international setting. To make trainings effective, it is important to have trainees with an equal position and skills.

Endorsement (diplomas) and social position and fame of the trainer or training institute (experience, job function) are important. Therefore, certificates and public honour are supportive.

Given these cultural aspects, it is inevitable that, to be effective, knowledge sharing to farmers, managers and employees in the Chinese culture takes into account these aspects. Against the background of a hierarchic decision-making, workers can be trained, and stimulated and even incentivised, to observe well and immediately report, to make it possible to react adequately.

### 2.2 Developments in production and consumption of pig meat

Developments in production volumes, efficiency and farming structure, as well as consumer demands, play a role in the selection of means that can be used to stimulate knowledge exchange effectively as well as the topics that need to be addressed.

**Production efficiency is lower than in the Netherlands**

The Chinese government intends to be about 95% self-sufficient in pig production (14th Five-Year Plan, 2021-2025) and recent market data indicates that the pig stock is almost back to a stable situation, after the severe outbreak of African Swine Fever (ASF). In 2022, the total number of pigs amounted to 453 million, of
which 43.9 million breeding sows (NBSC, 2023). With a total production of 700 million pigs in 2022, corresponding to about 16 slaughter pigs per sow and year, the production efficiency is low compared to 30.9 pigs produced per sow in the Netherlands (InterPIG, year 2022). An analysis done by the authors showed 80% higher production cost of slaughter pigs compared to the Netherlands (Summer 2021). Reasons were a 50% higher feed consumption per kg output, a 65% higher feed price, and a 40% lower number of slaughter pig produced per sow. This calculation is based on typical family farms (e.g., 500-1,000 sows farrow-finish). However, variation among farms is huge, with small farms having even lower efficiency and higher production cost, and large professional producers typically having a higher efficiency, as these can apply modern technology and better management. The higher production cost is also reflected in the realised market price, which amounted to about 17 RMB/kg live weight in the (pre-ASF) years 2016-2019, which corresponds to about €2.23/kg live weight; the average market price in the Netherlands in the same period amounted to €1.24/kg live weight.

**Chinese pig production is in a transition towards more large-scale production**

The pig industry in China is seeing a substantial shift, with backyard pig farms disappearing, and an increase of medium-size family farms (500-9,999 animals) and especially large companies, with sometimes hundreds of thousands animals on one farm location. This structural change was accelerated in the recovery phase after the ASF. The Chinese government focuses on the midsize family farms, but according to some interviewees, the real transition takes place at the large integrated companies. This is consistent with Schneider (2016), who concludes that Chinese agribusiness firms can be seen as leading the domestic transition to efficient and modern pig production. These firms build ‘on production models and logics from places such as the US, but adapting them to local conditions and politics’, as she stated. The Chinese government supports large-scale production by e.g., tax exemptions and subsidies. Especially the large companies are more efficient in zootecchnical performance and feed consumption, due to more professional management and data-driven decision-making. It is mentioned by several interviewees that large-scale production results in a less volatile production and market cycle.

**The gap between government goals and implementation at farm level is still big**

The outbreak of African Swine Fever (ASF) and Covid-19 disrupted the continuous development of the pig production in China in many aspects. This led to entrepreneurs and farmers focusing on short-term survival, rather than long-term strategies and planning. Interviewees indicate that this recently led to many discussions on topics like sustainable production (environment and economy), feed management, performance improvement, optimal farm size, and biosecurity. Several topics are being mentioned as state policy, e.g., zero carbon footprint in the year 2060, antibiotics reduction (to reduce the risk of antimicrobial resistance), self-sufficiency (95% in pig meat as of 2030), National Sustainable Agriculture Development plan (2015-2030), pork market stabilisation, availability of domestic protein feed ingredients, or control of animal diseases such as ASF. Part of these topics do not trickle down to implementation at farm level. According to interviewees, these topics are on the agenda of the government, but are hardly considered in decision making on farms. Companies, however, such as large integrators Mu’yuans or Shineway, are typically well aware of these topics and defined company strategy to handle such topics. Primary producers are said to rather feel an urgency in production-related topics, such as feed efficiency, animal diseases, cost of production, but also market prices. Translating the governmental goals to practical implementation measures on farm level is yet to be done, but awareness of farmers of the link between these policy goals and farm practices is low. Practical approaches to implement policy goals could be part of trainings.

**General awareness of biosecurity among workers on farms is low, leading to strict preventive measures taken by management**

The policy of strict measures can result in a lower attractiveness of working on the farm. An example of such a strict measure is a long quarantine period. In the interviews an example was given of a company where workers had to spend 5 weeks on a row on the farm premises, followed by 1 week off. However, such a biosecurity approach doesn’t make farm work attractive. In China the focus seems more on taking strict measures, while in other countries, such as the Netherlands, the focus is more on increasing worker awareness. On the other hand it becomes quite a challenge to recruit employees and to keep them on the farms. It was mentioned by several interviewees that most people don’t want to work on farms. Farm workers often have a low education level, payment is low, and loyalty of those who start working is limited.
On many occasions new employees left on average within 6 months. This results in a loss of acquired knowledge and experience, and low efficacy of trainings.

**Improving feed and zootechnical efficiency could be very beneficial for China**

China is almost completely import-dependent for top breeding pigs. Although, according to state statistics, the number of sows in China has recovered to a pre-ASF level (43.9 million in 2022, comparable to 43.6 million in 2018), still the genetic quality of the sow stock is not yet on level. This is also shown in the calculated output per sow based on state statistics. Danish breeding material is very popular in China, although it can be questioned whether managers are able to handle the highly prolific but care-demanding animals. Also, for feed ingredients China leans heavily on import, especially for protein ingredients, and feed prices are typically higher than in some other countries, such as the Netherlands. Therefore, improving feed and zootechnical efficiency is even more beneficial than in those countries.

Animal welfare is not really a topic of interest of farmers, nor for consumers. However, since animal health and welfare are interrelated, a good welfare is also in the interest of farmers. Farmers are aware of legislation on manure and wastewater disposal. The government closed quite some farms that didn’t comply. Devices for treatment must be installed.

**Data management could be improved**

Although a lot of production data are collected on the farms, several interviewees state that data management shows room for improvement. Software is typically developed by people who don’t understand pig farming. In the meantime, high-tech solutions such as pig face recognition are being developed. This is not only an answer to limited employee availability (and costs), but also improves supply chain guarantees (i.e., for animals treated with antibiotics), and might be applicable for animal welfare control as well.

A couple of topics have been described above, showing interrelationships (e.g., lack of biosecurity awareness and labour attractiveness). Topics are often not approached in an integrated way, but more as a single issue. This is a challenge, as well as an opportunity for knowledge providers and suppliers of turnkey farm solutions.

**After a decline, consumption levels are almost back to normal**

The consumption of pig meat takes place in a rather saturated market in terms of volume (Pan, 2022). Consumption was hurt by ASF (less availability) and Covid-19 (lockdowns). Interviewees indicate that after a recovery, this led to an equal or slightly lower consumption per capita, as consumers tried alternative proteins such as seafood or chicken meat and got convinced of their advantages. Consumption trends include convenience (ready-to-cook, ready-to-heat and ready-to-eat), lean meat and online purchases. According to an interviewee some 5% of the population might be interested in pig meat produced in an elevated animal welfare standard, or without antibiotics. Food safety concerns continue to be relevant.

A potential approach for knowledge transfer to pig producers in China will depend on and relate to the Chinese cultural background. Also, current developments in pig production and consumption are to be considered.
3 Lessons learnt from selected trainings

This chapter gives a description of selected trainings in which the authors were involved, for inspiration and an overview of lessons learnt. A few general findings are:

• Deal prudently with the language barrier (if necessary, make use of a translator, who should understand the culture of the trainees)
• Offer sufficient practicing opportunities and guidance
• Visit a demonstration farm (either physical or online) thereby explaining theory from the practical angle.

3.1 Wageningen Pig Class – Tailor-made programmes for Changrong and for DaBeiNong

Two online training programmes were organised by Wageningen Academy (part of Wageningen University & Research), in cooperation with Wageningen Economic Research and Roodbont Publishers (practical trainings), plus trainers from the industry and some practical pig farmers. The first programme was organised for students at Yuncheng university, and arranged for the company Changrong. Students intended to work in Chinese pig production management. The programme ran from September 2021 to February 2022. Fifty-three trainees followed the programme, mainly bachelor graduates of Yuncheng university (Shanxi), but also some company employees joined the training. The second programme was arranged for the company DaBeiNong (DBN). Fifty-eight trainees joined the programme, most of them already working in the company at different management levels and with different lengths of working experience.

The trainings were a combination of theoretical and practical training, focusing at integrating topics. Both programmes contained 7 sessions of 4 hours each, with a coffee break halfway each session. Sessions were held every two weeks. Short Q&A sessions were arranged in between the trainings. Trainings were given online, in English; training material was provided in advance. Students were invited to put questions to trainers in advance and questions were answered in between Q&A Sessions. Trainings were recorded and students could replay. The training was finalised with a test. Those who passed the test were handed over a certificate.

Topics per session:
1. General introduction of pig production
2. Pig behaviour and welfare
3. Pig Nutrition
4. Pig health
5. Pig reproduction
6. Pig farm management
7. Group assignments

Students were given assignments to work on during the entire course; topics were given, and students were divided into groups by a local teacher. Students were working on different assignment topics. Topics of the assignments were at the intersection of societal issues and farm implementation, and required consequential and integrated thinking:

• Implementing the Zero CO2 Footprint 2060 Policy Goal
• Reduction of antibiotics use on the farm
• Optimal data use in pig farming
• Balanced sustainability design
• Improving animal welfare.
The assignments were presented to the group and graded.

Trainings were evaluated and rated 4.47 out of 5 in the Yuncheng/Changrong training and 4.4 out of 5 in the DaBeiNong training. This means the participants were quite satisfied. Ninety-eight per cent of the participants think this online class meets their expectations and 93% would recommend others to participate in this online class. Almost half of the trainees in the DBN training didn’t pass the test. They mentioned the fact that the training was given in English, and that they had difficulty combining the training workload with their other work.

The long sessions (4 hours) were not negatively rated. Recording the trainings has helped students to overcome language barriers. Assignments are a good way for students to deepen their understanding of a specific topic; however, supervision and support are crucial.

Some quotes from the evaluation:

'I have a systematic understanding of pig raising and understand that pig raising is not just what I thought at the beginning, it is modern and scientific.’

'We can combine the advantages of these to make our own system. And from the explanation of the teachers of Wageningen University, I have broadened my career and learned about the development trend of the whole industry’.

And as suggestions for other trainings:

'I hope the course can be explained from simple to deep, the teacher can slow down because our spoken English from China is not very good.’

'I think students should be given more opportunities to practice.’

'It is recommended that each group be assigned a mentor, depending on the topic.’

'Enhance the communication between participants.’

'You can give more cases to discuss.’

### 3.2 Public private partnership project ‘Enhancing the South Korean pig supply chain’

During the years 2017-2021 an international project was executed, aimed at enhancing the South Korean pig supply chain. The main academic goal was to test three forms of learning and knowledge sharing among South Korean pig producers:

a. Mastery learning at a demonstration farm

b. Instruction/coaching: trainings to South Korean pig producers and advisors, focused on the state-of-the-art technologies and management practices

c. Cooperative learning by setting up study groups of pig producers.

Results are published in Wagenberg et al. (2021) and Lans et al. (2022). The project was funded by the Topsector Agri&Food, NACF, EPIS and involved companies.

During the period May 2018 to November 2020 three trainings were given to pig farmer advisors from South Korea, and three trainings to pig farmers from South Korea. Each training had some 6-10 participants. The trainings lasted a full 5 days and included a visit to a Dutch pig farm and lectures of researchers and company experts about multiple topics, such as animal health, biosecurity, feeding management, operational
farm management, data management, housing and climate, economic performance for sows, piglets and finishing pigs.

Van Wagenberg and Hoste (2021) describe the following outcome: ‘In satisfaction surveys held at the end of each training, participating pig farmers and advisors indicated to have high satisfaction with the training. Furthermore, several pig farmers that participated in a training later also took part in study clubs as a follow-up to the training. This indicates that the pig farmers saw added value in participating in these knowledge exchange innovations. Being satisfied with the trainings and other knowledge exchange interventions and voluntarily participating in them is an important first step in using acquired knowledge and ultimately in improving performance and management.’

Due to Covid-19 and the outbreak of African Swine Fever in South Korea, not all activities could be performed as planned. Therefore, a comparison of knowledge sharing arrangements was not possible. The demonstration farm was welcomed and a successful way of knowledge sharing. This farm is still active in South Korea and the farm owner acts as role model. This supports the idea that showing practices is very welcomed and useful as a means to share knowledge.

3.3 Wageningen Advanced Agriculture Master classes for pig farmers in South Korea

A one-year training programme has been carried out repeatedly for different groups of pig farmers in South Korea. This Wageningen Advanced Agriculture Master class (WAAM) programme is now running for the third year. The first master class ran in the period from June 2020 until June 2021, the second ran from October 2021 until July 2022, and the third class started in February 2023. Topics included: Animal health and biosecurity, Animal welfare, Breeding, Data-driven farm management, Economy, Farm comparison, Feeding, Housing and climate control, and Labour. The topics were presented as a combination of theory/academic background, and practical implementation, including real-time online farm tours and discussions with the farmers. Higher level learning goals were Knowledge, Awareness, Management and Feedback. The trainings were held online in English, with a consecutive translation into Korean and back. The translator was a native Korean and a content professional. Farmers were asked to write their own farm management plan to implement lessons learnt. Trainees were invited to share their questions on the upcoming topic in advance, and they were covered by the teachers. The class has a patron in Dr. Min Seungkyu, who is widely known in the Korean agricultural sector. Trainings were funded by Korean farmer and commercial organisations, including NACF and Sunjin.

The first class was followed by six pig farmers, being certified as so-called Meister farmers (a proof of excellency from the Korean government); the second class had 12 participants and the third was followed by 20 farmers.

Since this class was repeated and is now running for the third time, changes in the programme and approach were implemented, based on evaluations. Some quotes from the evaluation of the first class:

‘Changing the framework of innovative thinking, data-based pig management, how to prepare farm business plans, changing consumption trends of livestock products, and selling fresh pork using IT.’

‘The major areas of expertise that helped domestic instructors greatly were diagnosis and strategy of pig field, prevention and disease management, animal welfare, AI-based pig industry future, efficient pig farm management, specification and nutrition management.’

The overall evaluation of the first WAAM class was rated 8.57 out of 10 points.

The second class’s evaluation specifically pointed out the need for a practical focus: more (online) farm visits and less theory. Part of the programme was a diagnosis and evaluation of the South Korean pig industry;
this was highly appreciated. The overall evaluation of the second WAAM class was rated 9.4 points out of 10 points.

In the third class we further reduced the theoretical input and increased the number of farm visits. A farm management plan was not included, given the low interest and effort in the first two classes. Farm visits are implemented as real-time online visits, where a Korean-Dutch interviewer visits the farm, interviewing the farmer, translating and guiding a discussion between the farmer and the trainees.

3.4 Sunjin Master class Antibiotic reduction through hygiene management

This class was performed in February 2020. A group of 10 representatives from Sunjin company, mainly farm managers, were trained four full days in integrated biosecurity. The Master class was funded by Sunjin and performed by Wageningen University & Research and Schippers Group. The training was a combination of farm visits and theory, and a group assignment.

An evaluation showed that the combination of farm visits and theory was very insightful. The group assignments can be helpful, however, improved guidance could have led to better take-home-messages, as the group was very different in experience, knowledge and responsibility in the company. Also, the language barrier was felt limitative in discussions.

3.5 Wageningen Pig Class for Changrong (partial programme)

Based on the findings of this research, a training programme was drafted as a kind of partial validation. Three training sessions were arranged. To that end, the WUR Office in Beijing selected the medium-sized company Changrong, which had just initiated a three-year training programme for new employees. Trainees came from Shanxi Changzhi vocational school and Xinjiang Shihezi University. The three training sessions were incorporated in their programme. Topics were jointly selected. After the training sessions, there was a joint evaluation.

The three sessions were held in the period September–November 2022. The first session covered the professional pig production systems worldwide, including the pig life cycle and pig husbandry systems. The aim was to widen the view on modern, well-managed and performance-oriented pig production. Presentations were given by Roy Marissen, senior trainer at Aeres training centre international and Robert Hoste, senior pig production economist of Wageningen Economic Research. Differences between pig production, performance and challenges in China and the Netherlands were presented and discussed.

The second session focused on Biosecurity, knowing how (Standard operating procedures), and why biosecurity is necessary. An integrated concept of biosecurity was presented, as well as the relation to animal health and antimicrobial resistance was elaborated. The aim was to give input to a wise animal disease risk management, focusing on optimal biosecurity measures. Tijs Tobias of Animal Health Services (GD), and Joost van den Borne, lecturer Healthy farming at HAS University of Applied Sciences in Den Bosch, and Director R&D at Schippers Group, were presenting.

The third session covered the value chain: different stages, chain management, quality systems, supply chain failure costs, and understanding the carcass valorisation principle. The aim was to understand the role of pig farming in the production process of end products. Topics such as Antibiotics, Salmonella, Meat quality and Carbon footprint were addressed briefly. Robert Hoste, and Coen van Wagenberg, senior researcher supply chain and food safety, both at Wageningen Economic Research were trainers.

The sessions and presentations were a mix of academic and practical approach. Quite some photos and practical examples were used in each session to link theory to practice. Trainings were given online, in English. Training material was provided before the sessions, and students had a class meeting to prepare the
topic in advance. Trainings were recorded and students could replay. Trainees sent additional questions after the sessions to the trainers and received answers, either during the next session or by e-mail.

The training was evaluated by the Chinese partners themselves. The trainees indicated that they like the training very much. They are satisfied with the setup of the contents and the interactive lecturing. Besides, it also provides an opportunity to have pure English language class, which is not possible in their universities. The students liked the integrated biosecurity course best, as it closely related to farm practises. This session was said to have led to a change in behaviour and way of thinking of the students when they do field studies. The other two sessions were good to expand their view on the pig industry and the pig value chain.

3.6 General experiences from the training programmes

In this section, a brief summary is given of experiences in the training programmes, that were coordinated by Wageningen University & Research, mentioned in Section 3.1-3.4.

In our trainings we typically arrange a combination of theory/academic background, and practical implementation, including real-time online farm tours and discussions with the farmers. This practical angle is very much welcomed.

Another element is that in some trainings, trainees have been working on Group assignments, or on an Individual Development Plan. With the students we worked with group assignments, which worked well, under the condition of a clear outline of goal, steps, limitations, and suggestions on how to approach, as well as guidance from local teachers. Assignments were presented and graded.

Topics included Animal health and biosecurity, Animal welfare, Breeding, Data-driven farm management, Farm economy, Farm comparison, Feeding, Housing and climate control, Manure handling, and Labour. In all these issues, we focus on hard skills (technology, tangible measures), software/computer application, and soft skills (awareness, integrated thinking, responsibility). This is also shown in the feedback of one of our trainings (Figure 3.1; based on the training for DBN in Section 3.1), with terms including knowledge, pig, farming, and welfare, as well as ability, responsibility and control.

![Figure 3.1 Word cloud with keywords of participants’ feedback](image-url)
In Asian cultures people seem to have a stronger focus on hard skills, and increasingly on software application; however, soft skills are less pronounced. This is supported by interviewees (see also Hoste et al., 2012).

To stimulate effectiveness of the trainings, we provided training material in advance (students could read the material in advance) and recorded the entire meetings (students could replay; this was especially helpful where the English language was a barrier for some students). In some trainings a translator was involved who is a content professional. Some feedback is listed in the Box below.

**Some brief feedback of trainees**

- Practical lectures, participatory education, and field links are needed rather than theoretical content
- Please increase student interaction
- Class of 3 hours is too long; limit to 2 hours
- Students should be given opportunities to practice
- Highest ranked topics were: Change of mind frame (momentum of mind innovation), Data-driven pig management, and How to prepare a business plan in pig management
- Field interviews with Dutch farmers are highly appreciated
- Major concern is the fact that it is given in English
- Course content is too much: some students did not complete the programme
- We feel the need for more in-depth collaboration between companies and universities
- The experience of combining some classical lectures with the practical situation was decidedly good
- Developing my own Individual Development Plan was a very important activity; I will apply it in my own company
- I do believe that there is enormous potential to develop production in our country together with the Netherlands
- We not only got a lot of knowledge, but also inspiration on communication, collaboration and farm planning
4 Developing a training concept

In this section we present a training concept based on past experiences. The result is summarised in a table in Section 5.

4.1 Target audience should be distinguished between companies and family farmers

Interviewees agree that both large companies (middle management and workers) and family farmers can be targeted in knowledge sharing, each with their own challenges and approach. Interviewees advised not to focus on backyard and small farmers.

Family farmers should be distinguished from companies, as such farmers combine the functions of entrepreneur, manager, and craftsman in such a way that this combination enables him to successfully achieve his goals (Bergevoet, 2005). This especially holds for farmers where the farmer and his family provide the labour force. With increasing farm size, and number of employees, the three functions are typically spread over multiple persons. An entrepreneur is characterised as the innovator, risk-taker, provider of capital, decision-maker, and visionary leader (based on Bergevoet, 2005, Brandstätter, 1997). A manager specifically focuses on implementation and control of plans and processes, whereas a craftsman performs the actual work with the animals (Bergevoet, 2005). In family farms, these functions are often held by the same person, the farm owner. Therefore, trainings for family farmers should cover all three areas of expertise.

In training for companies, different target audiences are related to different management levels. A clear segmentation should be made among company managers, plant managers/middle management, and farm workers.

Based on experiences and interviews we suggest the following skills to be trained for different management levels in both companies and family farms (Table 4.1).

<table>
<thead>
<tr>
<th>Table 4.1</th>
<th>Skills to be trained at different management levels, split into companies and family farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required skills</td>
<td>Management level</td>
</tr>
<tr>
<td></td>
<td>Top</td>
</tr>
<tr>
<td>Companies</td>
<td>Entrepreneurship</td>
</tr>
<tr>
<td></td>
<td>Management skills</td>
</tr>
<tr>
<td></td>
<td>Craftsmanship</td>
</tr>
<tr>
<td>Family farms</td>
<td>Entrepreneurship</td>
</tr>
<tr>
<td></td>
<td>Management skills</td>
</tr>
<tr>
<td></td>
<td>Craftsmanship</td>
</tr>
</tbody>
</table>

As shown in Table 4.1 the skills to be trained should be clearly targeted to the various management levels in companies. This is further elaborated below.

Large companies have different training needs

Larger companies are characterised by top management, middle management, and workers, focusing on entrepreneurship, management and craftsmanship, respectively.

Top managers of large companies have the need to get a better understanding of the coherence within the supply chain and opportunities for e.g., a traceability system, as well as a better understanding of the
market, and a focus on sustainability. An individual tailor-made consulting or training programme would be most suitable. We will not elaborate on this training concept in this report.

Employees in the middle management are a main target group for knowledge sharing trainings, since they, as link between top level and work floor, have a clear need to better understand the company strategy, farm processes, pitfalls, risks and opportunities of management decisions. They also should be able to understand consequences of top management decisions and implement them in practice, and vice versa, understand consequences of the operational management on company strategy and outcomes. According to interviewees, higher-level employees, such as middle management, are not always aware of what goes on in the daily practice of farm operations. In trainings, this target group should be trained to understand the consequences of management decisions in daily activities and outcomes, as well as in transferring the knowledge to hands-on workers. These managers should also be trained in people management: leading and controlling workers. Companies often want to train newly recruited staff, especially those on management levels. This is an opportunity for setting up trainings.

Farm workers are to be trained in craftsmanship, in getting a better understanding of the nature of a pig, the production cycle, consequences of decisions on animal behaviour and performance. They should have basic consequential thinking, e.g., on biosecurity management.

According to interviewees, farm workers in large companies tend to stay in their job for a very short time, typically less than half a year. This is related to low attractiveness of the work due to the smell, noise, and very strict biosecurity measures, where employees stay on the farm day and night for a couple of weeks or months, alternated with a break outside the property. This means that a training aimed at farm workers seems to be hardly efficient. On the other hand, these employees need to be able to perform basic skills. A typical approach then is to define standard operating procedures, with simple tasks, that require little training. Moreover, many people on farms and in production companies have only basic education so the information should be tailored to their level.

To overcome these limitations, a train-the-trainer approach might be considered, if the company wants to invest in the employees on the ground. Trainers-to-be, typically middle manager, must really understand the message and can then become an ambassador for specific insights. It may be considered to have the workers on the ground involved by using their smartphone. For instance, Pig Signals, the animal-focused management approach of Roodbont Publishers, might be an interesting approach.

Further it was suggested to combine both a manager and workers in a training class to reach out to all of them, and to take care that newly acquainted knowledge is disseminated. This should be combined with sufficient time for bilateral contacts between trainer and all students, so that students are able to put their questions in a trusted environment. The typical hierarchical culture should be kept in mind in such a setting.

Family farms need a focus on improving entrepreneurial skills
Family farmers typically operate independently from the rest of supply chain. According to interviewees their interest is rather basic: how to improve efficiency, mortality, biosecurity. Farmers intend to relate their ‘strategy’ to the market situation (which is not only the case in China): if prices are high, they want to learn, but not if prices are bad. If the market sentiment is negative, farmers don’t intend to buy vaccines or purchase replacement gilts.

Additionally to the training approach mentioned for the companies, this means that focus should be given to entrepreneurial issues, such as (insight into) a longer horizon in farm management, and trying to proactively overcome the pig cycle (market fluctuations). Also, their perspective could be widened to cover the entire supply chain. To put it differently: apart from managerial and zootechnical training, entrepreneurial skills are to be elaborated to those farmers (farm owners). As shown in Table 4.1, the farmer in family farms should cover all three skills. Therefore, the farmer should also be involved in training management and craftsmanship issues, such as recognising animal diseases, sustainability or biosecurity, to name a few. Regarding the middle management trainings should cover management and craftsmanship issues. As in companies, workers should be trained in craftsmanship issues (animal-related activities). As with company trainings, a train-the-trainer approach might be considered.
4.2 Knowledge arrangements

Training approach: A balance is needed between hardware, software and mindware

Back in the sixties, Dale (1969) developed the so-called ‘cone of experience’, showing the relevance of a combination of different knowledge acquainting means. Reading, hearing, seeing and writing, as well as an active involvement of the student in terms of efficacy of the learning process, are increasingly helpful to remember to instruction. It is assumed that only 20% of what is heard can be remembered; if combined with seeing, this accumulates to 50%. Further increase to 90% is possible in case of active involvement (Lalley and Miller, 2007). Our training approach should therefore contain multiple means of learning.

Learning styles are different ways of acquiring and sharing knowledge, such as participatory learning or social learning.

‘Participatory training actively involves and motivates learners by drawing upon their own experience and skills in solving problems, using examples and situations of interest to them in their daily lives, and using a variety of new, enjoyable, and often visual teaching methods.’ (cited from Bradley, 1995).

This is a typical approach in farmers’ study groups in Northwestern Europe. Farmers possess much expertise, based on experiences and/or training. Participating in study groups will give farmers insight into consequences of certain practices, and into the perceived likelihood that these consequences will emerge (Leeuwis and Van der Ban, 2004). Whether the concept of study groups can be implemented in China is not known. Yet, to actively involve trainees, internships and trainee programmes might be an option. Based on this, active involvement, e.g., in group assignments or developing personal plans, and farm visits are to be considered in trainings.

In the training approach, a good balance must be considered between hardware (machines, tangible), software (e.g., management information systems), and mindware (awareness) (Figure 4.1). Especially the awareness is difficult to show, and does not always meet the culture, but should be part of the learning goals. For training awareness, (additional) internship on Western (oriented) farms might be helpful.

![Figure 4.1 Hardware, software and mindware to be combined](source: own composition)
Miscellaneous

One interviewee said that Chinese people don’t want to pay for knowledge, but only for products. Therefore, it is a challenge to combine product sales and trainings, and present trainings as sales support.

Trainings can be given online, and in English. However, it depends on the audience whether this is efficient, since it requires concentration of students, and language skills. Understanding the culture is highly important. A local intermediary, familiar in the language and culture of both trainees and trainers, and skilled in the training topics, may be inevitable, depending on the culture, language, and knowledge gap between trainees and trainer.

Efficiency of trainings can be improved by students preparing the topic, and by looking back the recorded class trainings. They can also be embedded in individual or groupwise development plans. Trainings are being used to elaborate an own topic of interest, in combination with e.g., interviews with local experts, or literature.

Given the hierarchical culture, it is advised to have trainers with authority, either based on experience and/or on endorsements (academic rank, country, organisation, etc.). Students or young people have much more difficulty to get their message accepted. Trainers from the Netherlands have the advantage of being seen at the background of a highly professional and efficient pig production in their home country. Advice on farms, as part of after sales activities, can be effective, as trust is being built.

4.3 There are roughly six thematic areas that should be covered in training modules

The Sino-Dutch Research Test and Training Center (RTTC) in Anping aims for an integrated sustainable approach, focused on improving animal health, welfare and vitality of sows, piglets and fattening pigs in China, as well as reducing the environmental impact of pig farming, and stabilising and enhancing business performance. It outlines 6 groups of areas of interest: Performance & Efficiency, Animal Health & Biosecurity, Data Intelligence & Innovation, Management Training & Education, Sustainability & Environment, Food Safety & Traceability (RTTC, no year). These areas are also pointed at by the interviewees. One of these interviewees stated that managers don’t have a knowledge gap, but rather a mindset gap. To meet this, good examples could be shown, for example by (virtual) farm visits elsewhere. This is what RTTC stands for.

Antibiotics are heavily used in Chinese animal husbandry (Mulchandani et al., 2023), likely as risk premium at a low cost. Presenting an integrated biosecurity and animal health concept can be helpful to understand that reduction of antibiotics is possible, and at the same time improve health and zootechnical performance. This way the related governmental policy can be translated to practice.

Improving production efficiency is often mentioned as relevant topic for farmers. This partly relates to animal health. Since many animal diseases occur in China, and especially the African Swine Fever, a lot of attention is demanded for biosecurity. Farmers lack both education (awareness) and technology, especially the smaller farms. Although traditional farmers are not expected to be willing to learn or adapt, they are a risk for other farms. Therefore, a biosecurity plan should include identifying risks from other farms in the vicinity. Some interviewees say that there is need for a simple biosecurity concept for small-scale farms.

When it comes to biosecurity, it was said that standard operation procedures should be in place for farm workers, and employees should first know how to act, before understanding why they act. Biosecurity risk management in China is typically more pronounced, with strict and heavy measures (e.g., the process of entering a farm may take a few days; farm workers staying on the farm day and night for several weeks or longer) and in the meantime protocols are not always well considered. This also relates to a lack of trust and understanding of employees. There is room to advise on a well-balanced approach.

Family farms have need of applying a management information system (MIS). Research in South Korea (Van Wagenberg et al., 2021) showed that about half of the sow stock in the country was held on farms...
using an MIS; and the frequency of application of the system varied from daily basis, to about once a month. This is likely applicable in Chinese pig production as well, especially on small-scale and family farms.

Management of farms and companies is often based on economic indicators such as cash and liquidity, which may easily result in decisions that are optimal in the short term, but less optimal in the long term. Therefore, company and farm strategy and implementation should be based on integrated and long-term indicators.

Companies’ top-level management may have need to have more insight into how to organise and coordinate a supply chain as a whole. In a wider perspective, interviewees also mentioned that companies’ management should understand trends in consumer demands, meat quality, carbon footprint. Further, especially such managers should be able to understand the logic of consequences elsewhere in the supply chain of actions in their own operations.

According to interviewees there is ample room for improving a comprehensive understanding of processes. The interconnectedness of actions on one place and outcomes on another is little understood. China’s culture has long been focused on factual knowledge, rather than understanding. Related to this, workers are typically not discussing, but following instructions. This results in limited room and preparedness to take responsibility, and more in a hierarchic structure. It will be a challenge to cope with the existing culture and still invite employees to questioning procedures and findings. So, family farmers and middle-sized private farming companies are better targets for such trainings. One interviewee from China stated it as follows:

‘The era of making money by working hard has passed; knowledge and level of thinking is determinant for future farm running’.

The knowledge system in the sector was said to be insufficient and single-issue focused, rather than innovation led. An interviewee mentioned that science-based advice to the Chinese government, on topics such as biosecurity, may support identification of practical farm measures. The transfer from knowledge to operational policy is always a challenge; interaction and communication between industry and policy makers are very necessary.

4.4 Dutch companies have a potential role in knowledge transfer to Chinese pig producers

The Dutch agricultural sector, more specific the pig sector, is a role model for the Chinese pig industry. This is proven by the implementation of the RTTC concept.

To be acceptable to Chinese customers, Dutch companies should have an office in China. Then they should build a network, and work on understanding the local situation and needs. Frequent contact with customers is necessary to build on trust, and to hear the actual challenges and needs of farmers. Therefore, topic-specific seminars focusing on actual issues for farmers can be organised. In brief: accompanying clients, based on understanding their needs, is necessary, rather than just trying to sell. It was also stated that knowledge exchange should be part of the marketing mix. When introducing new technology, the necessary investment and payback period is very important.

Further it was advised to cooperate with local companies, with local universities, or with well-known farmers’ associations. Such associations are present in most of the Chinese provinces; they have great influence and have contacts with farmers.
5 Conclusion and recommendations

Based on the interviews, literature search, experiences in other trainings and on the validation, and against the background of the Chinese culture, a training concept was designed for people involved in pig production at companies and family farms in China. Table 5.1 gives keywords of the training focus, approach, and topics, per type of responsibility.

**Table 5.1 Training focus, approach, and topics, per type of responsibility**

<table>
<thead>
<tr>
<th>Type</th>
<th>Focus</th>
<th>Approach</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrepreneur</td>
<td>Company strategy focus System approach Value chain Link between farm activities, output, and sales Long-term thinking</td>
<td>Tailor-made programme</td>
<td>Value chain cooperation Consumer demands Sustainability Functioning of markets Financial management</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle management</td>
<td>Farm process focus Management skills Biosecurity concept People management Link between strategy and daily practice Data-driven management Leading by example</td>
<td>Train-the-trainer Blend of theory and practice Online Preparation Assignments</td>
<td>Data-driven farm management Farm economy Farm comparison Labour and People management Plus, Animal and husbandry related topic for Workers (see below)</td>
</tr>
<tr>
<td>Workers</td>
<td>Animal focus Pig life cycle Animal husbandry, behaviour, health, performance Standard operating procedures</td>
<td>Practical training Limited time per session On farm training</td>
<td>Animal health and biosecurity Animal behaviour and welfare Reproduction Nutrition and feeding Housing and climate control Zootechnical performance</td>
</tr>
</tbody>
</table>

Source: Own composition.

It is recommended to arrange trainings for the middle management and for farm workers at companies, as well as for farm owners of family farms. Characteristics of such trainings are described in Table 5.1.
Sources and literature


RTTC, no year. *Sustainable pig farming; Research, training & technology application center. A Sino-Dutch, private public collaboration*. Master Plan.


Appendix 1  Interviewees

Prof. Dr. Jimin Wang, Deputy Director General, Institute of Agricultural Economics and Development of Chinese Academy of Agricultural Sciences, Beijing, China

Ms. Chenjun Pan, senior industry analyst, Rabobank China, Hong Kong

Dr. Zengyong Zhu, Deputy professor, Institute of agricultural information, China Agricultural Academy of Sciences (CAAS), Beijing

Mr. Jake Tang, Head of Strategic Development and Solutions, China and Asia, Hendrix Genetics, Shanghai

Mr. Jun Yao, chairman of Shanxi Changrong Agricultural Science and Technology

Mr. Terry Emonds, International biosecurity expert pigs, Schippers Group, Bladel

Mr. Wyno Zwanenburg, programme director, Research, Test & Training Center (RTTC) in Anping (Hebei)

Mr. Jan Cortenbach, CTO, Wellhope - De Heus

Dr. Ina Enting, Beijing Wan Dai Ying Animal Husbandry Consultancy Co., Ltd.
Appendix 2  Example of training program

Table A2.1 gives the details of the training programme of the third WAAM class in 2023 (see Section 3.3).

**Table A2.1  Training programme of third WAAM class in 2023**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Date</th>
<th>Presenters</th>
<th>Farm visit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction &amp; diagnosis of Korean pig sector</td>
<td>23 Feb</td>
<td>Pig production economist, WUR</td>
<td>Sow farmer</td>
</tr>
</tbody>
</table>
| Animal health & biosecurity         | 23 Mar | Animal disease specialist, WBVR  
Hygiene specialist, company       | Company demo farm                |
| Feeding and nutrition               | 27 Apr | Feed specialist, breeding company      | Sow farmer                  |
| Breeding and genetics               | 29 Jun | Breeding specialist, breeding company       | Sow farmer                  |
| Labour and farm organisation        | 27 Jul | Company expert in data and farm management | Farm entrepreneur           |
| Smart farming                       | 7 Sep  | Representative of Technology company         | Sow farmer                  |
| Manure management                   | 21 Sep | Manure processing consultant                | Finishing pig farmer with manure processing |
| Housing & climate control           | 26 Oct | Climate control specialist from company    | Finishing pig farmer        |
| Animal welfare                      | 23 Nov | Animal welfare specialist, WLR             | Organic pig farmer          |
| Profitable pig farming & closing ceremony | 21 Dec | Pig production economist, WUR              |                             |
The mission of Wageningen University & Research is “To explore the potential of nature to improve the quality of life”. Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 7,600 employees (6,700 fte) and 13,100 students and over 150,000 participants to WUR’s Life Long Learning, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.
Improving sustainable Chinese pig production by sharing knowledge from the Netherlands

Robert Hoste, Jie Yan