



# Adaptation and Upgradation of Biosecurity Systems in Large Pig Production Companies in China

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# Outlines

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**Increased risks after the ASFV outbreak**

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**Our biosecurity `theory` and upgraded responses**

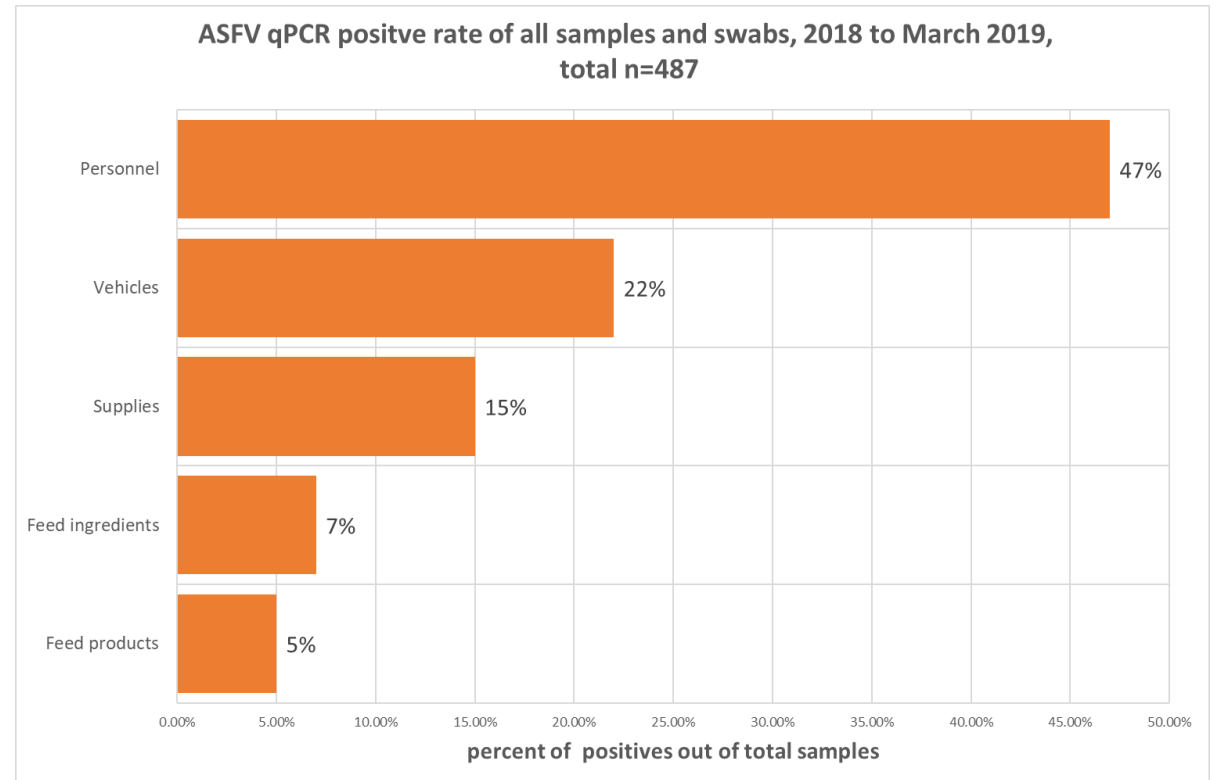
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**Carrier control and facility improvement strategies**

# Widespread contamination at early stage

# Carriers and Transmission Routes

- Now we think we understand better
- **Widespread outside contaminants: meats, fomites, transportation tools**
  - Meats-kitchen ingredients
  - supplies
  - clothes/boots
  - transportation-dusts, drivers
  - Tools
- Note most positive feed samples were detected in the 1<sup>st</sup> six months after the 1<sup>st</sup> reported ASF case



# Carriers and Transmission Routes: feeds

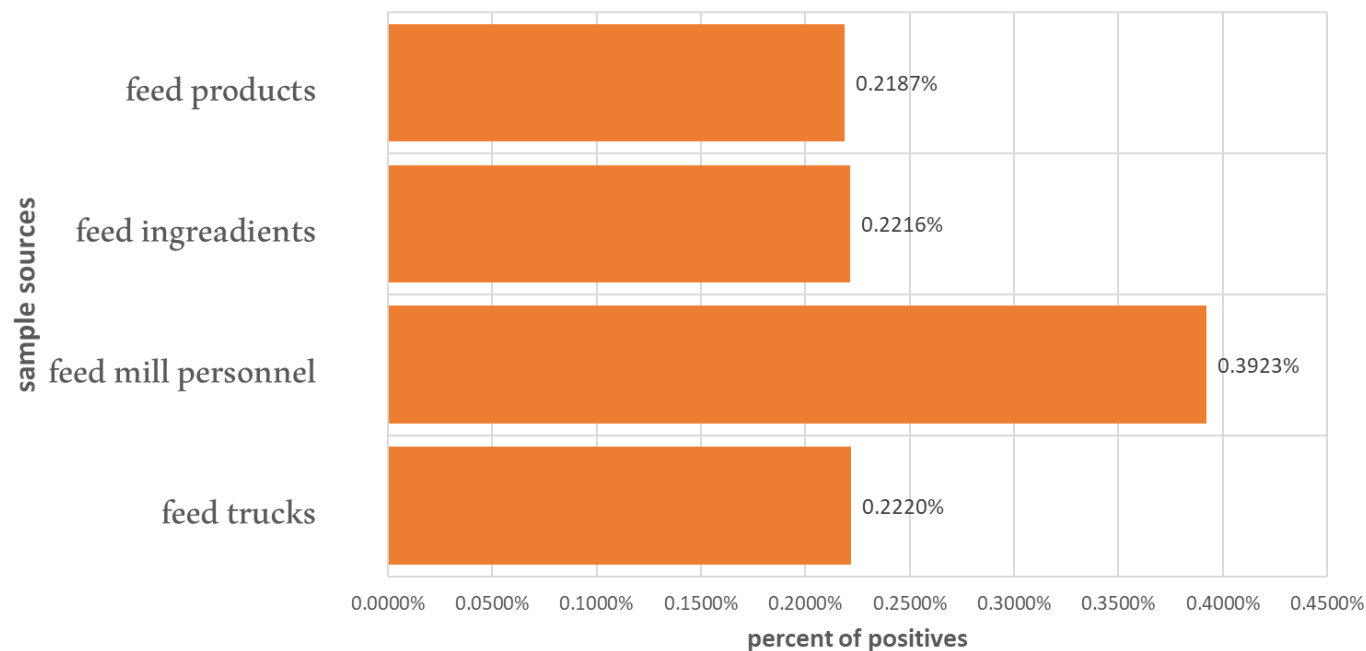
## Feed related contaminants-ingredients, products, packages

- Difficult to sample continuous material
- After 1<sup>st</sup> case reported, found more DNA positives in byproducts like hulls/brans. Worse in animal originated ingredients, suspected pork byproduct contamination
  - 2018 and early 2019: Corn, rice, beans harvested in 2018 might have higher risks
- More difficult to disinfect contaminated feed ingredient as organic matter
- Feed transportation to more locations, multiplier farm, sow farm, multisite finishers, create more risks to be contaminated

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### qPCR ASFV positive samples from feed mills in 2019,

total n=184,723



Most important pollution source at early days!

After ASF outbreaks reported, more positives samples from feed ingredients, feed products, and surfaces in feed mills

# Carriers and Transmission Routes: transportation

**Too many `connection links` between sites, added risks of infection**

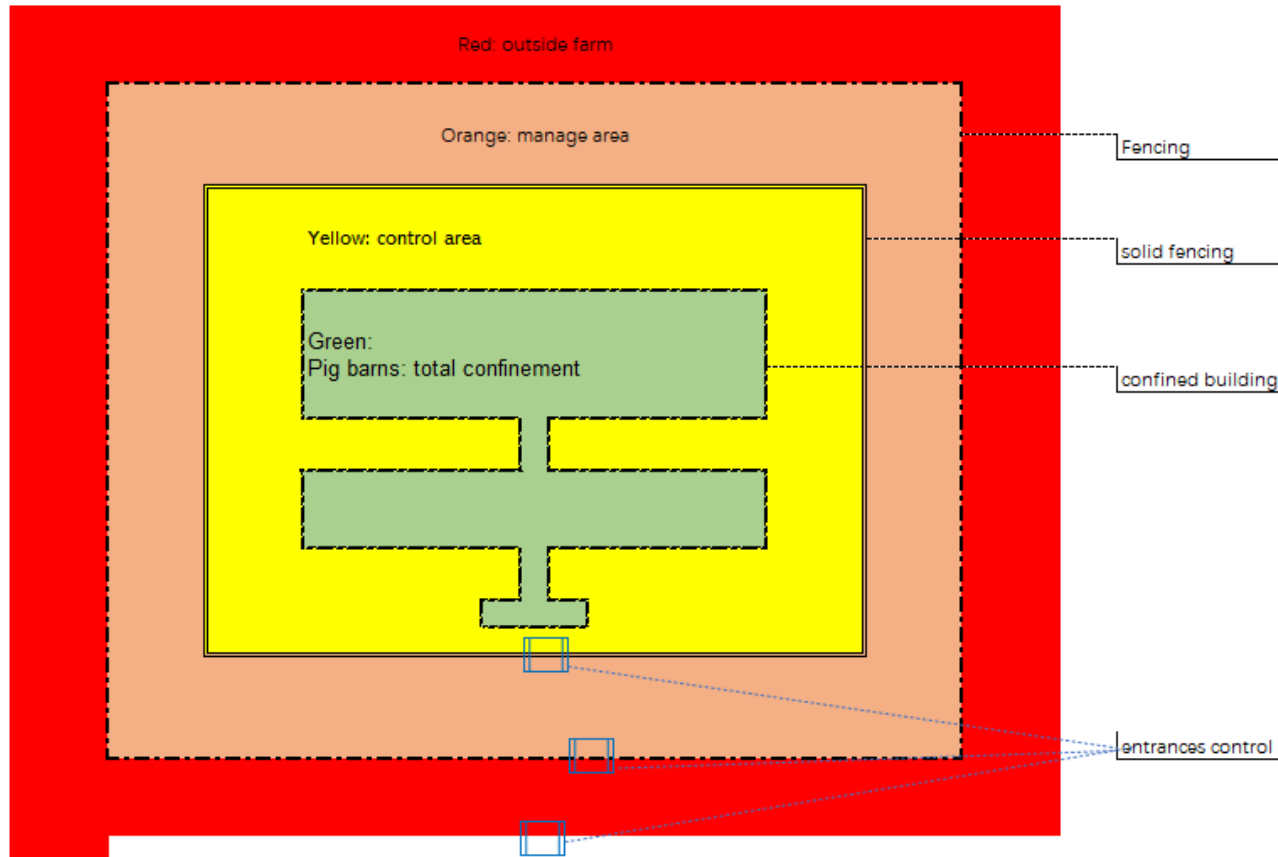
- Multiple transfer process across breeding farm, GDU, farrow-wean farm, nursery, finishers increased mixing possibility of fomite, personnel, feed, pig carriers
- Current multiple site production model is **NOT** unsustainable

# Carriers and Transmission Routes

## More evidences on mosquitoes, flies, rodents, and birds

- Presumable physical carriers

# Our biosecurity `theory` and upgraded responses



## Great wall and Pass `theory`: multiple levels, control lines and check points

- Great wall and pass `theory`: Animals are held in total confined `GREEN` buildings.
- There are multiple `wall` cycled areas around the green area to reduce risks of ASFV carriers

# The Wall, The Pass, and The Guard: which `wall` to stop what, and how



Yan, 2012

## Prioritize risk carriers

- |                           |                      |
|---------------------------|----------------------|
| 1. live animals           | 9. feeds             |
| 2. meat/blood/semen       | 10. dogs             |
| 3. manure/excretes        | 11. cats             |
| 4. bedding material/water | 12. rodents          |
| 5. vehicles               | 13. birds            |
| 6. tools and supplies     | 14. flies/mosquitoes |
| 7. clothes and shoes      | 15. dusts            |
| 8. personnel              | 16. air              |

# Great wall and Pass`theory: Protocols

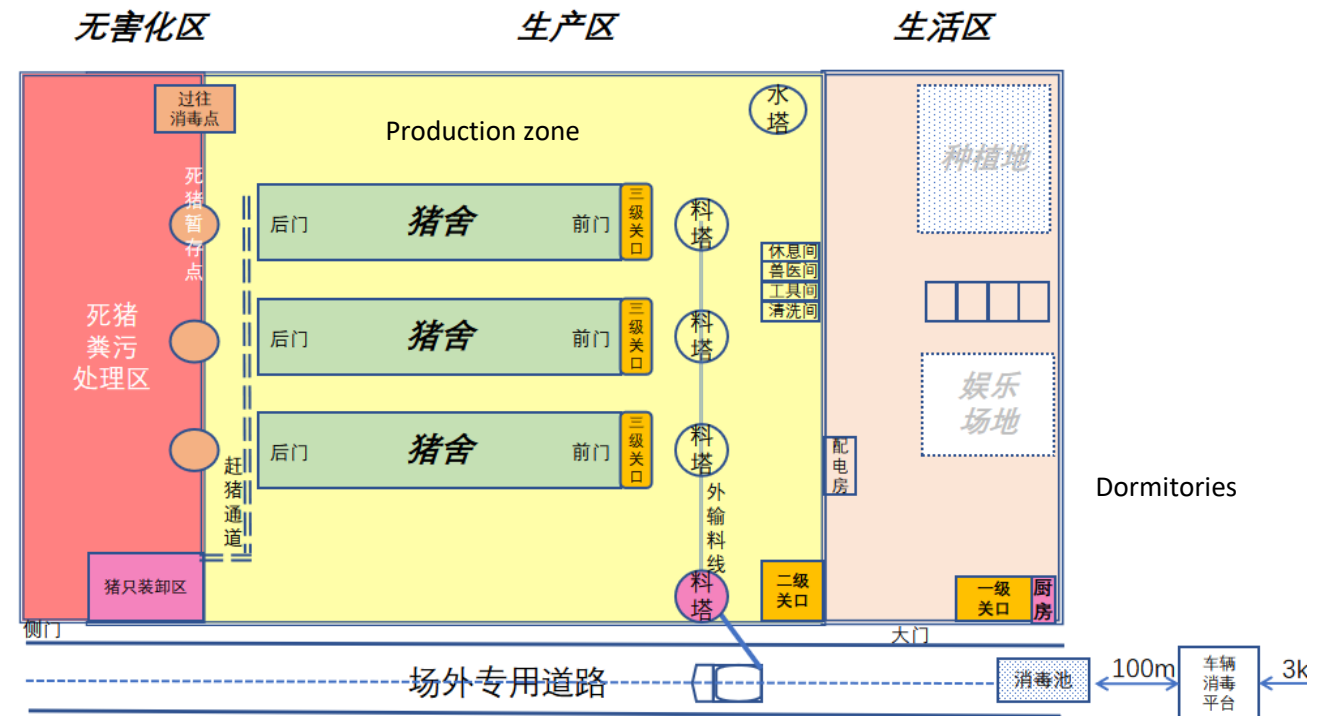
Great wall and pass `theory`: Animals are held in total confined `GREEN` buildings; there are multiple `wall` cycles areas around the green area to reduce risks of ASFV carriers

1. Designate number of **levels** of biosecurity to reach green area;
2. Define wall cycle **lines** of different biosecurity levels.;
3. Assign wall **pass** to cross a wall cycle line between different biosecurity levels;
4. Regulate type of risk factors/**potential carriers** to control and treat at different passes.

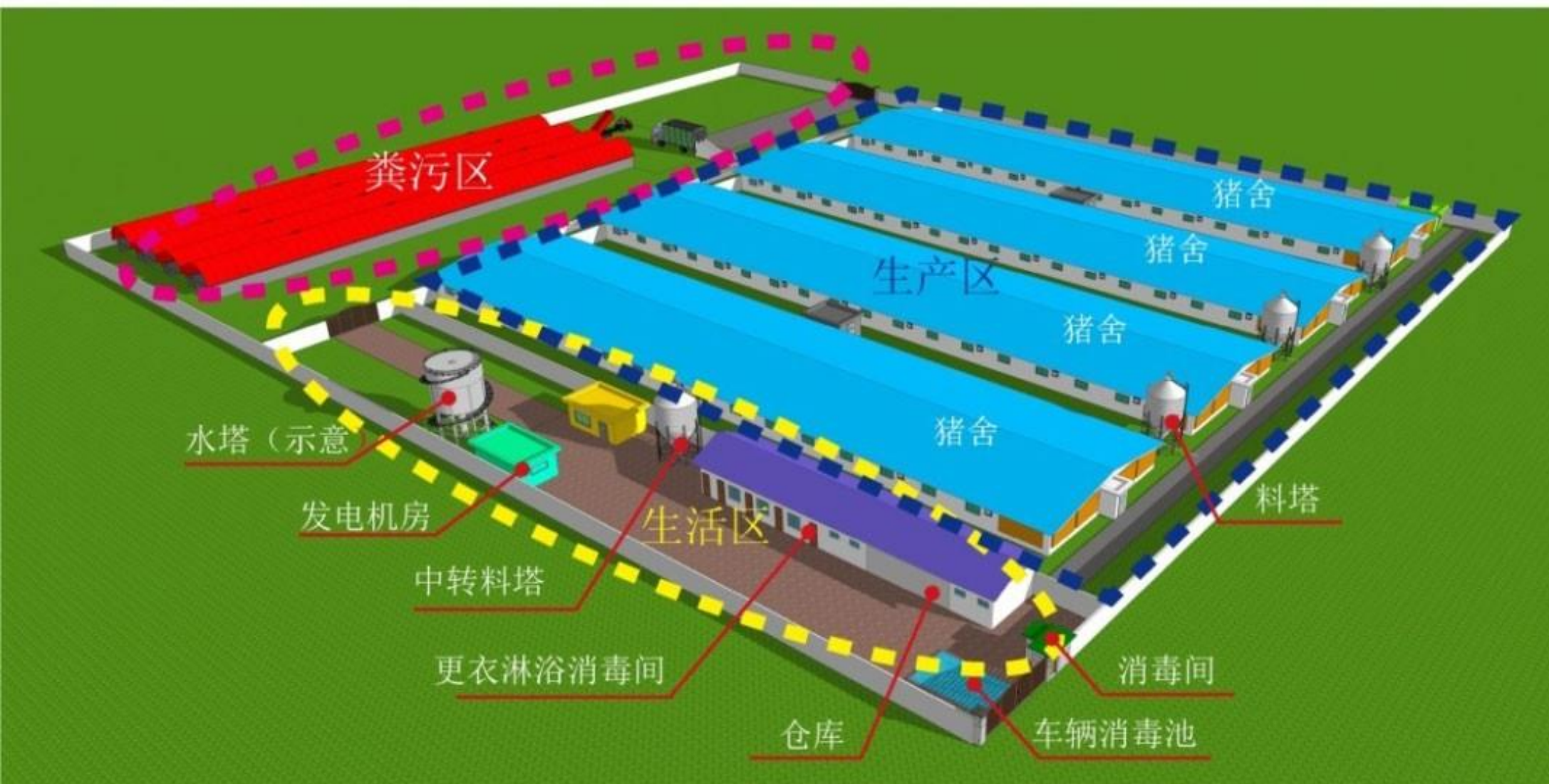
# Great wall and Pass `theory`: Make it simple

- Make sure all pigs living in totally confined barns;
- Clearly define wall lines for each biosecurity level and areas;
- PASS : check point

Manure treatment  
Mortality disposal



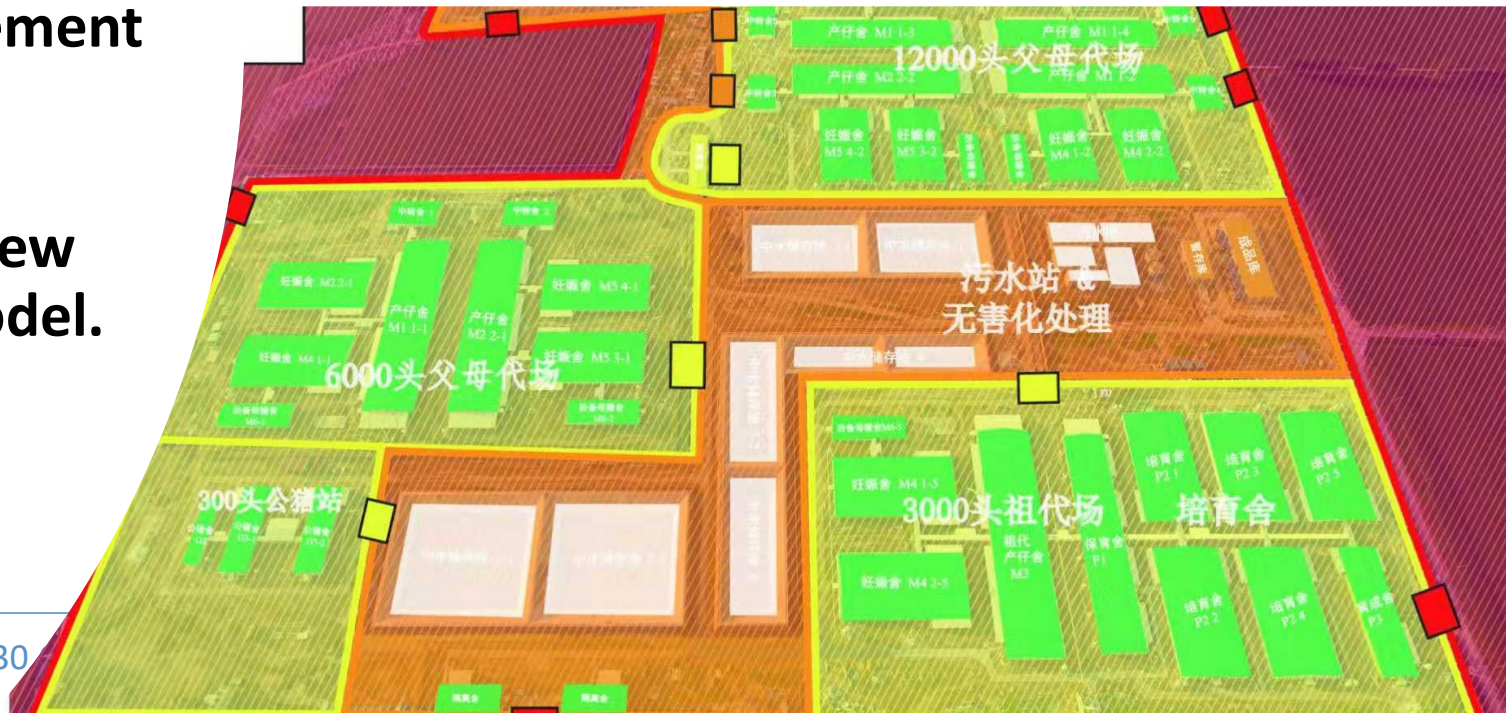
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# Pig flow and facilities upgradation

## Backing to new generation farrow-finish model

- All existing sow sites have on-site GGP/GP herds to produce replacement gilts.
- All new projects are planned as new generation farrowing to finish model.
  - On-site GGP/GP + PS sows + finishing
  - Large batch farrowing group



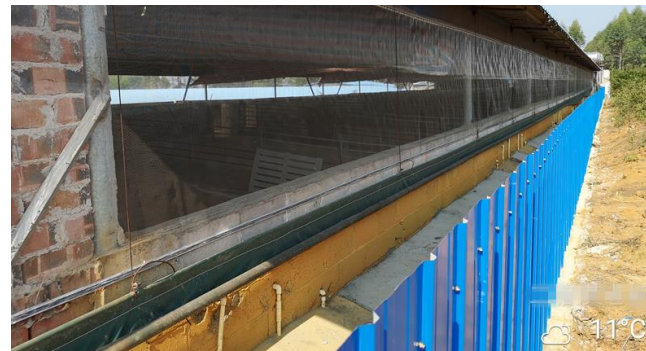
## Feed manufacturing: heat treated with higher temperature

- Apply great wall and pass theory into feed manufacturing facilities: green, yellow, red areas
- Customize conditioners of pellet mill to allow temperature reaching 85 degree for 3 minutes;
- All ingredients must be sampled before dumping and mixing;
- Daily swabbing ground surfaces, personnel, tools, vehicles of feed mills



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Remodel all  
conventional  
facilities into  
confinements



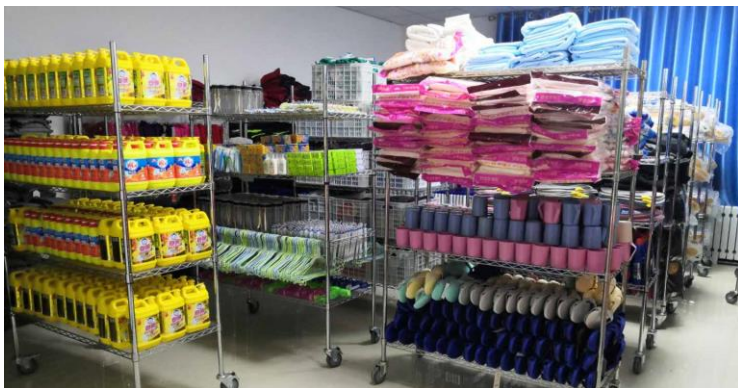
**Closed hallways, air inlets, flies and rodent stoppers**

# All trucks with pig contacts must be thoroughly washed, disinfected, and heat treated



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**All supplies are sorted, treated, disinfected, and repacked in central, off-site facilities before dispatchment.**



# Pig flow and layout: facilitate mortality and culled animal disposal



- Existing layout of crates and pens in barn provide excessive direct contacts among animals, **NOT** good to cull individual animal when detected positive.
  - Gestation rooms under same air space are too large
  - Finishing rooms under same air space are too large, pen size is too big, not solid partition.
- set up an `exit` for each building to move mortalities.

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### Upgraded on-site mortality treatment: Automatic, high temperature composer



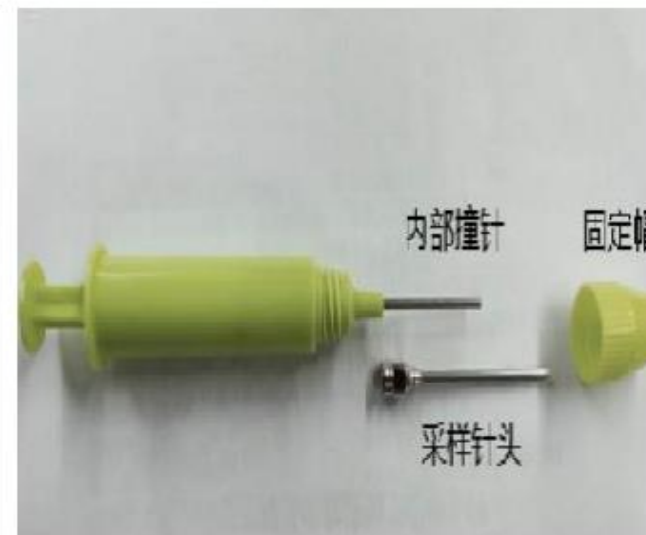
60 ~70 C for about two days  
out of total 12 days  
processing.

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### 棉拭子

Customized and standardized swabs for efficient sampling



### 淋巴结采样器

Innovative,  
minimally invasive device to  
sample lymph nodes

## Adaptation and Upgradation of Biosecurity Systems in Large Pig Production Companies in China

‘Thorough test and precise removal’ had been proven feasible and extremely effective to quickly stop the transmissions within a herd when ASFV DNA were detected from a few of animals by qPCR.

Recent practices in China suggested that producers were able to save overwhelming majority of animals if they had conducted thorough sample and test timely and remove all individual infected pigs in a shortest time.

# Summary

- At early stage, ASF outbreaks created widespread virus contamination on feed, supplies, personnel, vehicles that might contact pigs. Existed biosecurity systems have to be quickly upgraded for large swine production companies.
- Improving pig flow and feed manufacturing technology, converting open facilities into confinements, sampling and treating all incoming materials and supplies, optimizing mortalities disposal are some of the imperative measures in the new biosecurity system.
- To control ASF transmission within positive herd, new generation `Thorough test and precise removal` had been proven feasible and extremely effective in China.