

A comparison among different solutions for functional transformation of old cattle houses into finishing pigs houses

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Introduction

In the last few years in Italy many cattle houses, also recently constructed, have been available, owing to activity cessation from breeders. There are various solutions for the reconversion of cattle houses to piggeries. Previous studies aim at pointing out the possible works both for the reconstruction and for the realization of equipments and installations [1, 2]. Now we turn our attention to define the parameters for valuation of the different constructive solutions and to supply indications on the technical-economic convenience.

The survey takes into consideration fattening pig houses, placed in the production area of the typical Italian heavy pig, for Parma Ham or San Daniele Ham preparation.

Materials and Methods

The analysis regards the main typologies of finishing houses. The experimental phase is based on surveys carried out in six different pig farms, where pig houses were obtained by the transformation of cattle houses. These six farms have different housing solutions. The works of construction and installation have been examined.

Data concerning the working times needed for cleaning and straw bedding management have been collected as well as feed distribution, animal health management, animals moving data. Finally, farm statistical data regarding productive performances (feed conversion efficiency, growth rate, mortality), energy use and straw use (in houses with bedding) have been analyzed.

Both on the basis of information collected in the examined piggeries and of numerous investigations in other rebuilt pig houses we have pointed out the main typologies of pig houses obtained from cattle houses in the preparation area of Parma or San Daniele Ham. A detailed estimate of quantities has been developed for each typology, in order to value the rebuilding costs.

Results and Discussion

The main constructive works regarding the housing solutions, the feeding supply systems, the slurry or muck management are shown in table 1. These information have been used to execute the calculations and work estimates. For each rebuilding solution we have supposed to realize an automatic regulation system of natural ventilation.

The following figures 1, 2, 3 remark the main constructive aspects assumed in the analysis of constructive costs.

BEFORE REBUILDING	Type	AFTER REBUILDING		
		Housing solution	Feeding system	Slurry management
Beef cattle house	A1	Unchanged cattle slatted floor	Ad libitum dry feed	Existing channel
	A2	Solid floor, outside dung passage	Rationed liquid feed	Channel with fixed weir
Tethered dairy cows house	B1	Solid floor, inside dung area	Rationed liquid feed	Channel with fixed weir
	B2	Drainage pipes below slatted floor	Ad libitum liquid feed - short trough	Slurry recirculation in drainage pipes
	B3	Sloped floor and straw bedding - straw self service device	Ad libitum dry feed	Manure mechanical scraper
Cubicle house for dairy cows	C1	Drainage pipes below slatted floor	Ad libitum liquid feed - short trough	Slurry recirculation in drainage pipes
	C2	Solid floor, inside dung area	Rationed liquid feed	Channel with fixed weir
	C3	Permanent bedding - straw supply by farm tractor	Ad libitum dry feed	End cycle manure removal by tractor
	C4	Weekly straw bedding removal - straw supply by tractor	Ad libitum dry feed	Weekly straw bedding removal by tractor.

Tab. 1. Typologies of houses examined in the survey: conversion from 3 different cattle houses to 9 different finishing pigs houses (indicated as type A1,A2; B1,B2,B3; C1,C2,C3,C4).

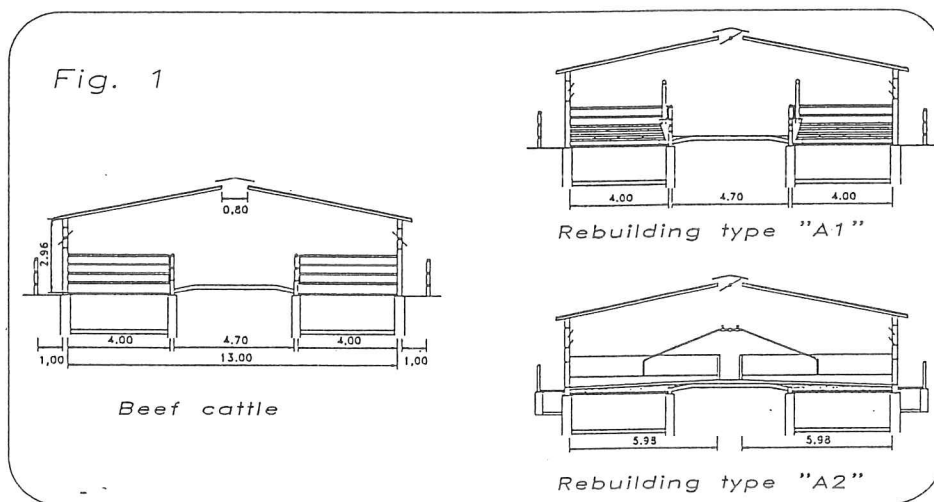


Fig. 1. Rebuilding solutions of a beef cattle house with fully slatted floor into pig houses: the type "A1" solution is designed for 600 fattening pigs; the type "A2" for 720 fattening pigs.

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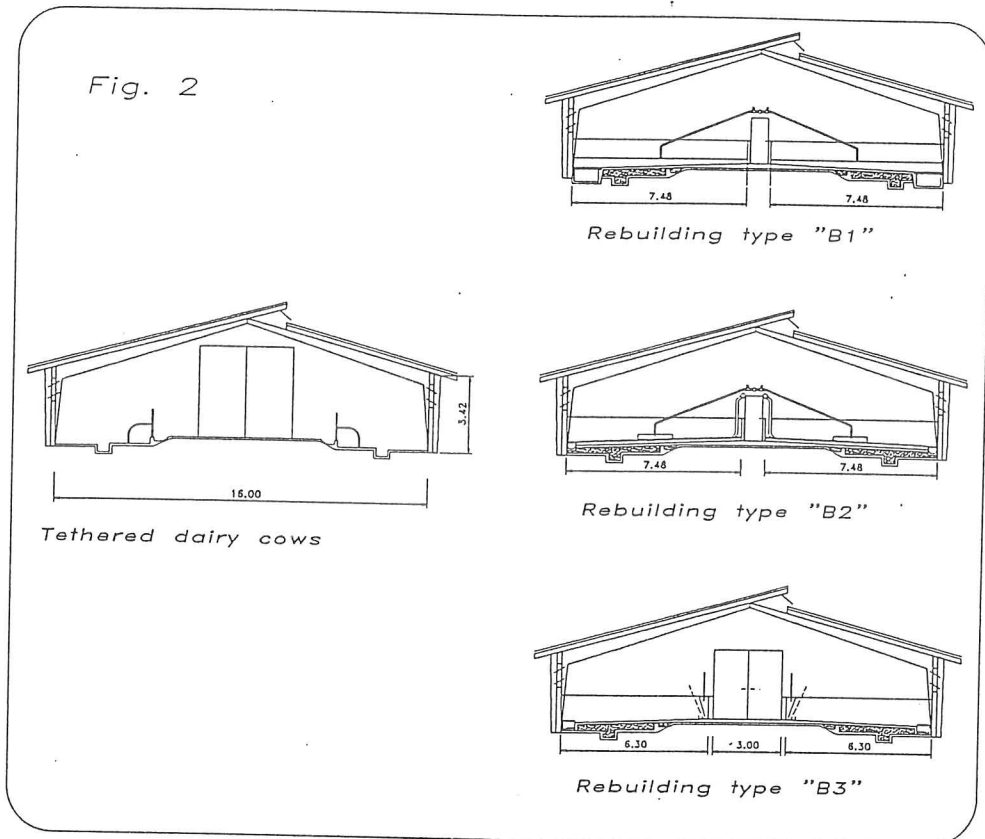


Fig. 2. Rebuilding solutions of a tethered dairy cows house into pig houses: the type "B1" solution is designed for 988 fattening pigs, the type "B2" for 988 fattening pigs, the type "B3" for 988 fattening pigs.

Rebuilding costs

The analysis of rebuilding costs for the different typologies is summarized in fig.4. The graph shows the rebuilding cost relative to the nine studied typologies. It is particularly clear the high variability of the rebuilding costs for the different houses. The lowest cost (about L. 100.000 / head) regards the simplest rebuilding solution (A1), in which the slatted flooring for cattle is not removed; so, the pigs are housed on the same floor of cattle. The rebuilding works are just limited to arrange the pen fences and gates. The highest reconstruction value (nearly L. 300.000 / head) is for a beef cattle house with slatted floor, transformed in a traditional Italian finishing pig house with inside solid floor and outside dung passage (with slatted floor) and rationed liquid feeding. Generally, the solutions with straw bedding have low rebuilding costs, even though with remarkable fluctuations in relation to the foreseen grade of mechanization.

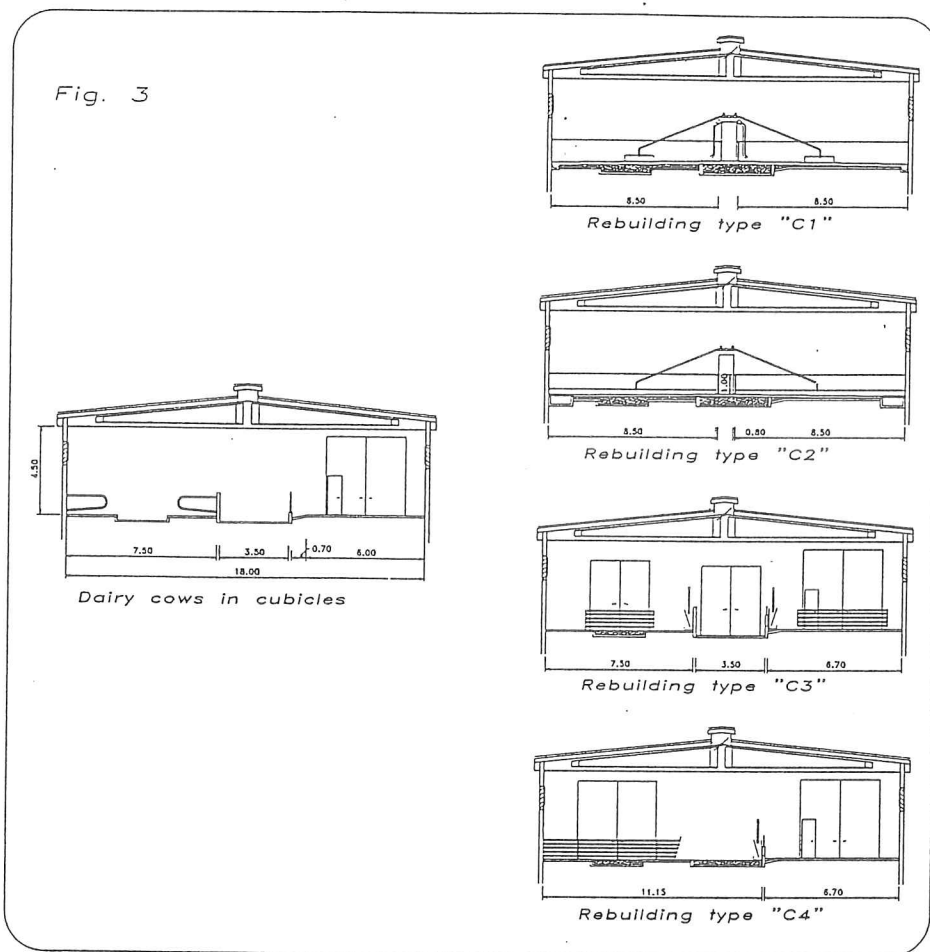


Fig. 3. Rebuilding solutions of a dairy cows house with cubicles into pig houses: the type "C1" is designed for 1020 fattening pigs, the type "C2" for 988 fattening pigs, the type "C3" for 600 fattening pigs, the type "C4" for 452 fattening pigs.

Labour

The labour employment is not very different for the feed preparation and distribution in the various typologies.

The more remarkable differences occur in the working of pen cleaning. The houses with straw bedding generally do not require high daily labour, but demand periodical labour peaks (for example, for deep beddings, at the end of the cycle).

Table 2 explains the working times measured during the trials for the different pig housing typologies. For some solutions we have remarked a very high excursion of the values, owing to the different level of automation of cleaning and feed distribution. The highest working time values have been noticed in pig houses with solid floor, the

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lowest in fully slatted houses. The piggeries with straw bedding present different working times, in relation to the systems of straw intake and manure removal.

The working times can notably increase in relation to design errors made during the reconstruction. Significant is the case of a pig house with a monopitch roof, fully concrete flooring, outside dunging passage, East-West orientation. In this house the lying area has been realized near the coldest wall: as a result, the pigs cannot recognize the resting area, so they dirty the whole pen; consequently, the working times for cleaning the pens are very high (64' / week . 100 pigs!).

Design errors affect also the working times for animals moving and for animal health management.

Productive performances

Substantial differences regarding the feed conversion efficiency have not been noticed among the various typologies. However, in cases of serious project gaps the index value is notably worse.

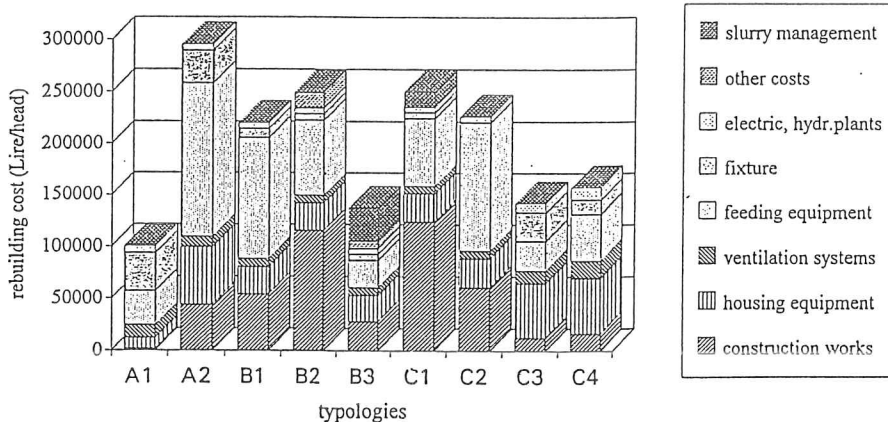


Fig. 4. Analysis of the rebuilding cost relative to the different cattle houses transformed into pig houses. The total cost is distributed among the different cost items.

Labour times (sec/head.day)	Typology								
	A1	A2	B1	B2	B3	C1	C2	C3	C4
> 12		■	■				■		
8 - 12								■	■
4 - 8	■			■	■	■			
< 4				■		■			

Tab. 2. Working times measured in fattening pig houses obtained by cattle houses (the working times are marked off with dark squares).

Conclusions

Table 3 summarizes the main parameters which have to be considered in case of a transformation of a cattle house into a fattening pig house. For each item we have given a valuation (from "very positive" to "negative"), based both on the data collected during the experimental survey and on the impressions matured during the pig farms visits and the interviews to breeders and field technicians.

Valuation parameter	Typology								
	A1	A2	B1	B2	B3	C1	C2	C3	C4
Rebuilding cost	○	●	●	●	○	●	●	○	○
Building-designing simplicity	○	●	●	●	●	●	●	○	○
Labour employment	○	●	●	○	○	○	●	●	●
Energy use	○	●	●	●	●	●	●	●	●
Productive performances	○	○	○	○	○	○	○	○	○
Animal health management	○	○	○	○	○	○	○	○	○
Animal welfare correspondence	○	○	○	○	○	○	○	○	○
"Ham" circuit suitability	○	○	○	○	○	○	○	○	○

- Very positive estimation
- Positive estimation
- Scarcely positive estimation
- Negative estimation

Tab. 3. Summary of the main parameters to take into consideration during the reconversion of a cattle house into a fattening pig house.

A complete transformation of the cattle houses, with high capital investment, gives technical-economic results not always better than those obtained with simple solutions. It is important to remark, however, that the examined typologies are used for housing of finishing pigs destined to "Ham Circuit", even if only some of them have the requirements fixed in the "Prescriptions concerning the breeding of pigs for preparation of Parma Ham".

The designing phase, which aims at conciliating the productive requirements with animal welfare and environment respect, is a key element for a correct transformation of a cattle breeding structure into a pig breeding one. The mentioned purposes can be realized without alterations of the external appearance of the existent building.

References

- [1] Barbari M., Fantuzzi C.: *Criteri progettuali per la riconversione di stalle per bovini in locali per l'allevamento di suini e conigli*. Proceedings Seminario 2° Sezione AIGR, Sassari, 13-16/6/1994.
- [2] Barbari M., Fantuzzi C.: *La trasformazione di stalle per bovini in porcilaie*. Rivista di Suinicoltura n.1, 1995, 13-32 (dossier).