

## SOME PROBLEMS OF KEEPING DAIRY CATTLE IN COWSHEDS WITHOUT INSULATION

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**The conditions of keeping dairy cows in cowsheds with light enclosures without insulation in areas with average temperature of the coldest five-day week lower than - 25°C have been considered. The analysis of the gained experience and production engineering norms for horned cattle breeding enterprises has been carried out. Unsolved problems have been found. Some recommendations on choosing rational solutions and updating designing norms have been given.**

Nowadays the economic criteria for animal food production in Russia are the same as in other European countries. Market mechanism gives chances to those competitive farms which produce is cheaper. However at present the available technical facilities in animal farming are substantially obsolete and do not meet new social and economic requirements. Milk production in the country reduced from 55.7 million tons in 1990 to 32.6 million tons in 2008; dairy cows livestock decreased two times - from 20.5 million to 9.2 million [1]. In many regions the cost price of milk production exceeded the selling price.

In dairy cattle fanning there are deep structural changes initiated by the government in frameworks of the national project on accelerated development of animal industry. By 2010 productive capacities of the branch are to have been increased by 400 - 500 thousand cows. Modernization of this field should provide not only substantial improvement of economic indicators, but also improvement of produce quality meeting the market requirements. Cheap state credits have involved large investors into the branch (milk processing and trading firms, banks, etc.). More than 700 investment projects have been declared to be realized. They involved reconstruction and building of dairy farms and agromplexes basically large costly enterprises for 400 - 2000 cows.

As world practice shows, both capital investments in building and current inputs into production in some cases can be considerably reduced by means of cow keeping systems in unheated noncomplicated in construction cowsheds without insulation. Wide experience relating to management of such cowsheds has been gained in Germany [4]. In Poland cold keeping and management of cows are practiced at the breeding enterprises, more than 8500 kg of milk per lactation being obtained [8]. Similar cowsheds are also common in the Baltic countries [9] and other EU countries [7].

Sheds for cold cattle keeping have also appeared on highly developed cattle breeding farms in some regions of Russia recently. Unlike EU countries these areas have less favourable climatic conditions: e.g. the average temperature of the coldest five-day week in Leningrad region is - 29°C (milk yield - more than 6400 kg per cow), in Moscow Region - 28°C (milk yield - more than 5700 kg). A number of firms have offered some projects to be realized on the basis of foreign know-how. It is necessary to sum up available experience, define possibilities and introduction conditions for light designed cowsheds without heating and insulation.

The research was carried out according to the following methodological positions: any farm can be called adequate if cattle keeping and management technology in the best way corresponds available farm buildings, equipment, feeding, milking and waste disposal machinery which allows minimizing aggregate milk production expenses. Organization and management conditions on a farm should provide due environment to the cattle.

At to the cowsheds estimation the following factors influencing the cattle welfare and produce quality [5,6] are to be considered: an optimal level of ventilation, dust pollution, concentration of gases, temperature, air humidity; availability of essential surroundings meeting physiological and ethological animals' requirements; elimination of stressful situations, first of all at feeding, exercises and rest time.

Cowsheds of various types for free range dairy cattle keeping with or without bedding were examined.

Available practices were compared with the requirements of production engineering norms for cattle breeding farms, obligatory for newly organized and reconstructed farms and complexes [2].

The microclimate requirements for both confinement and free range cattle keeping systems are the same. In areas with winter temperature  $-25^{\circ}\text{C}$  and even lower cowsheds should be equipped with heating and ventilation systems to make available the temperature  $+10^{\circ}\text{C}$  and air humidity 75% with air renewal over 15 m<sup>3</sup>/h per 100 kg of live weight. Such microclimate should be provided during the whole period of keeping, taking into account stocking density, disinfection, etc.

In fact, the standards do not allow keeping dairy cows in the unheated sheds. And there are different microclimate requirements for different systems of cattle keeping and management. Steady temperature  $+10^{\circ}\text{C}$  can be reasonable for confinement keeping as milkmaids are to be provided with satisfactory working conditions during milking. It is out of need under free range keeping condition when milking takes place in a warm milking hall.

Cattle have good thermoregulation. Being fed with well-balanced rations, Holstein cows did not reduce milk yields even when the temperature fell to  $-10^{\circ}\text{C}$ . When the temperature was below  $-10^{\circ}\text{C}$  supplementary feeding was needed and there existed an increase of hair-coat covering. Animals are reported to feel good in fresh cold air with short-term temperature falls up to  $-20^{\circ}\text{C}$  [8].

Difficulties are sure to arise under high air humidity and inadequate gas structure conditions in cowsheds. In ordinary cowsheds with insulation due to some economic reasons mechanical ventilation and heating are used by turns that is additional heating into the stalls are given without ventilation. Such practice causes serious problems in winter. There was decrease in milk yields and increase in cows' diseases even when temperature was above zero but air humidity and harmful gases concentration were high because of poor ventilation.

Modernization of ordinary cowsheds (e.g. public corporation "Zelenogradskoe") with effective natural ventilation (outflow - through a vent slot in the roof; inflow - through window apertures, plastic blinds being used only during frosty periods) allowed to maintain good health and high milk yields of animals (more than 7000 kg a year) at the temperature below  $0^{\circ}\text{C}$ .

Unlike low temperatures overheating is more dangerous for cows. Cattle react weakly to low temperatures, but what is comfortable or even cool for people is already hot and unfavourable for them. Bad appetite, decrease in milk yields and live weight losses are observed at  $21^{\circ}\text{C}$ . At the temperature above  $+25^{\circ}\text{C}$  yields, as a rule, reduce sharply.

The basic function of cowsheds is to protect animals from rainfalls, draughts and overheat, which can be performed, for example by application of cheap and simple wooden enclosures without insulation. Cowsheds with such constructions are thought to be more favorable. In order to reduce expenditures roundwood can be used.

The blind copying of foreign experiences does not always give expected results. Half-open cowsheds without insulation with rubber mats instead of common bedding and

feces removing through the slatted floors are popular in the EU countries. But this system has appeared not to be suitable for other environmental conditions. At temperatures below zero slatted floors are getting icecovered, feces removal system stops working, unfavorable conditions for cows' health are generated (e.g. cold stalls, slippery floors, bad microclimate).

Half-open sheds with deep bedding in rest zones would be more suitable for cattle kept at low temperatures. Warm bedding is straw in amount of about 10 kg a day per cow considering the minimum size of a rest zone 5 - 6 m<sup>2</sup> per cow. Being fed properly high productive cows are able not only to feel good at low temperatures but also to warm a bam. Manure is an additional source of heat if straw bedding is not less than 40cm. Application of group frostproof thermo-bowls equipped with individual electric units for water heating solves the problem of cattle watering at low temperatures.

The main principle of building cowsheds is: not to save on zero cycle (floors and waste disposal systems) but to reduce costs of overground elements - a frame, walls, coverings, by applying light constructions. Damages of zero cycle and equipment connected with it could be dangerous for animals' health and also cause ground water pollution by feces.

It is important that farm buildings can be used until current keeping and management technologies have to be updated. The duration of this period is considered to be approximately 20-25 years. Heavy constructed cowsheds built 20-30 years ago are designed for 50-100 years exploitation. They are out of date and need either partial or radical reconstruction to meet modern requirements.

Cost reduction for building and management of cowsheds for free range keeping system is obtained by means of using economical wall and covering installations, avoiding expenses of heating and mechanical ventilation systems and essential reducing of energy consumption. It results in profitability of milk production (Fig. 1).

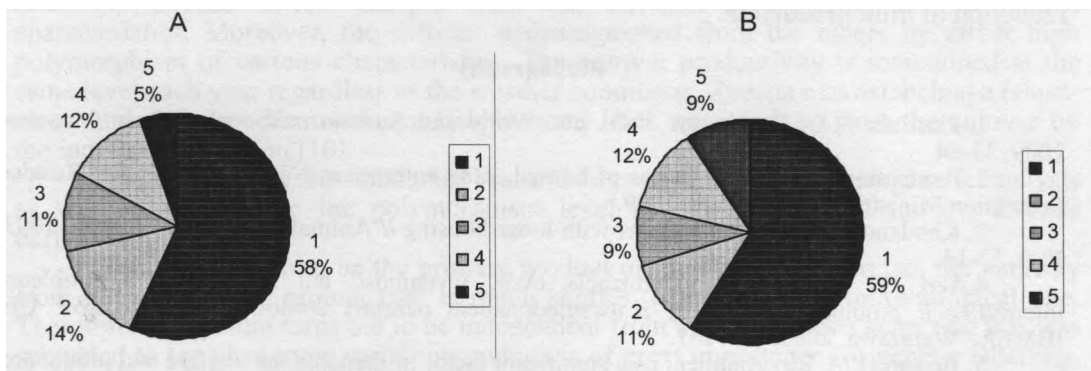


Fig-1- The structure of milk cost price under free range system per 200 cows:  
 A - a box cowshed of an ordinary design; B - a cowshed without insulation with a wooden frame;  
 1 - fodder, 2 - labour costs, 3 - depreciation, 4 - other costs, 5 profit

A common mistake in designing cowsheds for cold season keeping is due to absence of basic approaches. Choosing a cowshed type (unheated or heated, with or without insulation) it is necessary to pay attention to all aspects concerning animal keeping, feeding and breeding, including livestock density, complement and moving; microclimate, waste removal and recycling, engineering and veterinary control; farm management and labour organization as well, considering local conditions and human factor.

To avoid the operational problems cowsheds for cold season keeping should be built only on farms with high-yield livestock having due amount of fodder and bedding, applying up to date technologies of raising calves and heifers under cold conditions.

As to farms having more than 200 cows the following technical practices can be recommended: free range keeping systems: with bedding, raising heifers under cold conditions; light designed confinement cowsheds without insulation, unheated, with natural ventilation through a vent slot in the roof and apertures in walls; feeding - unchanged ration all the year round, feeding "to appetite", availability of fodder - 20 - 22 hours a day; dispensation of fodder with mobile feed-mixers; milking - in milking halls using the automated installations "Yeolochka", "Parallel", "Karusel"; the mechanical way of waste disposal (delta-scraper, bulldozer).

### Conclusions

Unlike confinement cowsheds, free range cowsheds for high-yield cows with bedding do not need heating. Enclosures are enough to protect animals from rainfalls, draughts and overheating.

Sometimes it is unreasonable to follow all technological design standards (insulation of enclosures, heating and compulsory mechanical ventilation in cowsheds under free range keeping system) as it raises the price of building operation and the cost price of milk production.

In regions with average winter temperature lower than  $-25^{\circ}\text{C}$  profitability of farms and agrocomplexes can be achieved by cutting down expenses and safe energy policy, by introduction of free range keeping systems for high-yield cows in the half-open sheds with light enclosures.

It is necessary to update and alter engineering design norms for building new and reconstruction current farms on the basis of the experience gained lately considering cost reduction of milk production.

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