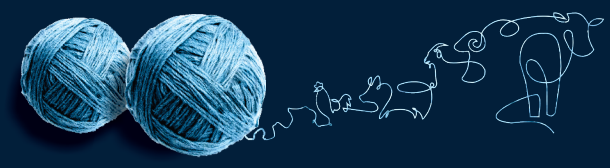
12th
INTERNATIONAL
SYMPOSIUM

MODERN TRENDS IN LIVESTOCK PRODUCTION



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9 -11 October 2019, Belgrade, Serbia

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Belgrade - Zemun, SERBIA

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Ministry of Education, Science and Technological Development of the Republic of Serbia

ORGANIZER

Institute for Animal Husbandry
Autoput 16, P. Box. 23,
11080, Belgrade-Zemun, Serbia
Tel: +381 11 2691 611; +381 11 2670 121;
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Address:

Institute for Animal Husbandry,
Autoput 16, P. Box 23,
11080, Belgrade-Zemun, Serbia

Tel:
+381 11 2691 611
+381 11 2670 121
+381 11 2670 541
Fax:
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E-mail: biotechnology.izs@gmail.com
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INVITED PAPERS

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GENERAL PRINCIPLES AND GOOD ANIMAL WELFARE PRACTICES ON DAIRY CATTLE FARMS

Slavča Hristov[1], Dušica Ostojić Andrić[2], Branislav Stanković[1]

[1]University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Zemun, Serbia
[2]Institute for Animal Husbandry, Belgrade – Zemun, 11080 Zemun, Serbia
Corresponding author: Slavča Hristov, hristovs@agrif.bg.ac.rs
Invited paper

Abstract: Field experiences and scientific observations point out the need to define a guide which would describe widely applicable general principles and good practices for ensuring the welfare of dairy cattle. The key action areas in the guide should be stockmanship, feed and water, living environment, husbandry practices and health management. There is a set of principles in each of these key action areas that should be used to further define the good practice of ensuring dairy cattle welfare in farms. The most important issue for the implementation of good welfare practices for dairy cows is stockmanship. Appropriate nutrition is a basic requirement and it is considered to have a great role to ensure good dairy cattle welfare. Environment, space, equipment, microclimatic and hygienic conditions significantly influence the welfare of dairy cattle. Dairy cattle should be treated with care and in a consistent manner, taking into account their natural behaviour all the time, and in any case minimizing the risk of injury and distress. For the welfare of dairy cattle of particular importance are many health conditions as: lameness, mastitis, injuries, acidosis, milk fever and other metabolic diseases, diarrhoea and anaemia of calves, respiratory diseases, heat stress, arthritis and many contagious diseases. It is necessary to introduce systematic training of stockpersons in our country with special attention to stockmanship and responsibility, feed and water, living environment, husbandry practices and health management in order to achieve a stable system of ensuring good dairy cattle welfare.

Key words: dairy cattle welfare, general principles, good welfare practice

Introduction

Nowadays dairy cattle farms of different capacities are present in Serbia. The herd size ranges from several dairy cows and related categories in individual farms to several thousand in modern industrial farms. There are different systems

for rearing, accommodation and feeding of these animals. Also, in these production systems, there are different combinations from rearing the animals entirely in the barns to the simultaneous use of barns and pastures in different forms (*Hristov and Stanković, 2016*).

Today, ensuring the welfare of dairy cattle, in essence, the quality of life they have at any given moment is one of the key issues in milk production (*Hristov et al., 2012a; von Keyserlingk et al., 2014*). Ensuring the welfare of animals is largely dependent on farm size (*Robbins et al., 2016),* holding and accommodation system (*Ostojić-Andrić et al., 2011*), nutrition, use of pastures, husbandry procedures, veterinary measures, financial situation of the owner, state subsidies, as well as the competence of the stockpersons (*Broom and Fraser, 2015; Hristov and Stanković, 2016; OIE, 2018a, b*). The basic principles of dairy cattle welfare plan creation and implementation was described by *Hristov et al. (2015a)* and some aspects of state of welfare on Serbian dairy farms by *Ostojić Andrić et al. (2016a).*

Field experiences and scientific observations point to the need to define a guide which would describe general principles and good practices for ensuring the welfare of dairy cattle and which would be widely applicable. To do it, it is essential that the determination of the success of the implementation of good welfare practices on dairy cattle farms is based primarily on animal based measurements and to a certain extent on the provision of resources for the animals in the production system. This guide should identify key action areas in implementation the quality of a management system that takes into account the welfare of all categories of dairy cattle in the first place. The key action areas in the guide are stockmanship, feed and water, living environment, husbandry practices and health management. In each of these key action areas, there is a set of principles that should be used to further define the best good practice of securing dairy cattle welfare in farms *(Hristov and Stanković, 2016; IDF, 2019).*

The developed methods for the assessment of cattle welfare have contributed to the definition of good animal welfare practices on dairy cattle farms in form of the most important indicators of dairy cows welfare evaluation (*Hristov et al., 2012b*), their selection and implementation in on-farm assessment *(Ostojić Andrić et al., 2013),* relevance analysis and selection of key indicators for assessing the welfare of dairy cows *(Hristov et al., 2018),* different approaches to assess the welfare of dairy cows *(Hristov et al., 2014*) and assessment protocol for cattle (*Welfare Quality®, 2009*).

The aim of this paper is to describe the key action areas, namely their general principles, criteria and indicators in order to serve to implement good welfare practices in dairy cattle farms.

Dairy cattle welfare practices and stockmanship

The most important issue for the implementation of good welfare practices for dairy cows is stockmanship. The importance of good stockmanship and its benefits for the animals was described by *Rushen and Passille (2010).* To assess the relationship of stockpersons to animals very important is the knowledge of the influences on the avoidance and approach behaviour of dairy cows towards humans, i.e., avoidance distance of cows in the stable, avoidance reactions in the feeding rack and approach behaviour towards an unfamiliar person as well as approach to a novel object (*Waiblinger et al., 2003*). It is well known fact that human factors (attitudes, personality, self-esteem and job satisfaction) strongly determine behaviour towards animals, animal production and animal welfare. Many studies have emphasised positive human contacts as indicators of a stockperson's positive attitude towards animals and animal welfare in general (*Boivin et al., 2003; Waiblinger et al., 2003; Broom and Fraser, 2015*). Some very important aspects of ethical stockmanship were given by *Hemsworth (2007).* It is emphasized that housing and husbandry practices strongly affect farm animal welfare and thus stockpersons have a responsibility to provide specific standards of stockmanship for the animals. However, research suggests that the behaviour of some stockpersons is not as correct as it should be. Ethical discussion, using science and other considerations and involving stockpersons, livestock industries, government and the general public, should be used to establish and assure acceptable stockperson competencies across the livestock industries. Training programs targeting the key attitudes and behaviour of stockpersons presently offer the livestock industries good opportunities to improve human–animal interactions *(Boivin et al., 2003; Waiblinger et al., 2003; Hemsworth, 2007; Broom and Fraser, 2015; IDF, 2019).*

A good stockperson should have empathy for the animals concerned and competences to identify their needs and to provide them with the opportunity to satisfy them (IDF, 2019). Also, a good stockperson should have adequate knowledge of the needs and typical behaviour of all categories of dairy cattle (Broom and Fraser, 2015). Dairy cattle feeding should be fostered by positive relationships between stockpersons and animals, and in no case be reason for animal injury, panic behaviour, long-lasting fear and stress that can be avoided *(Hristov and Stanković, 2016).* Anyone who participates in different animal procedures as a stockperson, owner or other responsible person participating in a technological production process in any way should have developed competencies (knowledge, skills, attitude and other abilities), sufficiently to treat animals in accordance with the principles of welfare provision (*Broom and Fraser, 2015; IDF, 2019*). Principles of good welfare, have to consider essential to safeguard and

improve the well-being of farm animals are good feeding, good housing, good health and appropriate behaviour. Twelve clear criteria (absence of prolonged hunger, absence of prolonged thirst, comfort around resting, thermal comfort, ease of movement - other than health or resting-related issues, absence of disease - as well as neonatal and transport-related mortality, absence of pain induced by management procedures - including stunning, expression of social behaviours - balance between negative, e.g. prolonged and damaging aggression, and positive aspects, e.g. social licking, absence of injuries - except those due to disease or therapeutic or preventative interventions. expression of other welfare-related behaviours - balance between negative, e.g. stereotypies, and positive behaviours, e.g. exploration, good human-animal relationship - reduced fear of humans and positive emotional state) are also defined within the 4 principles (*Botreau et al., 2007*). It is particularly important that all participants in the technological process of dairy cattle production get acquainted with basic aspects described in guidance on risk assessment for animal welfare (*EFSA, 2012a*), outcome of the public consultation on the guidance on risk assessment for animal welfare *(EFSA, 2012d)*, statement on the use of animal-based measures to assess the welfare of animals *(EFSA, 2012b)*, scientific opinion on the use of animal-based measures to assess welfare of dairy cows *(EFSA, 2012c)*, EFSA's internal project on the use of animal-based measures to assess animal welfare in EU *(EFSA, 2015a)*, scientific report of EFSA on the effects of farming systems on dairy cow welfare and disease *(EFSA, 2009a)*, scientific opinion on the risk assessment of the impact of housing, nutrition and feeding, management and genetic selection on metabolic and reproductive problems in dairy cows *(EFSA, 2009b)* and scientific opinion on the assessment of dairy cow welfare in small-scale farming systems *(EFSA, 2015b)*.

Stockpersons, owners and any other persons in charge should be competent and well-trained, have experience and management skills that meet the level of technical requirements in the dairy cattle production system. In order to ensure the proper care of the animals, it is necessary to provide a sufficient number of employed persons for routine work, especially when it comes to peak activity. Veterinarians, animal husbandry engineers and other experts should be available continuously for advice on the animal care and should have supervisory capabilities. In order to monitor health and welfare, knowledge of the normal appearance and behaviour of all categories of dairy cattle is necessary. A competent stockperson should be able to understand the significance of changes in the behaviour of the animals. Also, it is necessary to know the early signs of distress or illness in order to be able to seek advice or intervention of a veterinarian in time. A competent stockperson should treat animals with compassion, anticipate potential problems and take the necessary preventive actions. Appropriate

equipment and instruments for the treatment of animals should be available (*Boivin et al., 2003; Broom and Fraser, 2015; Hristov and Stanković, 2016; IDF, 2019)*.

Stockpersons who apply applying procedures under the control of animal husbandry engineers or veterinarian should demonstrate competence in particular for husbandry and veterinary procedures that can potentially cause animal pain and suffering, for example, the disbudding of young and dehorning adult animals, assistance in parturition and in the course of puerperium. Stockpersons should also have basic knowledge about the procedures with animals in loading, transport and unloading in accordance with national and international regulations. The competent body should define educational or training programs for stockpersons who should include acquiring basic knowledge of animal behaviour and best practices that ensure good animal welfare. In some developed countries and supply chains, there are quality assurance programs in place that relate to best animal welfare practices (*Main et al., 2014; Broom and Fraser, 2015; Hristov and Stanković, 2016; IDF, 2019*). Right now, these programs are not present in our country, but in any case, the stockpersons are required to be already familiar with the all relevant national regulations, and afterwards with standards and schemes for ensuring the welfare of animals related to the quality and safety of products as well as the welfare of animals *(Hristov et al., 2012a; Hristov and Stanković, 2016)*. Anyway, keeping records should be ensured in order to demonstrate compliance with the quality assurance regulations and schemes (*Main et al., 2014*). In addition, it is necessary to continuously improve the technological process of production and in this way to prevent and correct the occurrence of the problems of dairy cattle welfare. Stockmanship can be generally improved by careful selection of stockpersons and by their training (*Boivin et al., 2003*). It is necessary to introduce systematic training of stockpersons in our country with special attention to stockmanship, feed and water, living environment, husbandry practices and health management in order to achieve a stable system of ensuring good dairy cattle welfare in the future (*Hristov and Stanković, 2016*).

Dairy cattle welfare practices and food and water

Appropriate nutrition is a basic requirement and it is considered to have a great role to ensure good dairy cattle welfare. Despite the importance of adequate water intake for both maintaining health and milk production, there has been very little research on drinking behaviour in dairy cattle. Stockpersons should be introduced to the feeding behaviour of dairy cows in order to consider improving cattle welfare and productivity (*Botheras, 2007*). They should keep in mind that inappropriate diets not only distort productivity, but also the health, behaviour and welfare of these animals. The animals must have access to enough food and water

that corresponds to age and needs to maintain normal health and productivity, to prevent prolonged hunger, thirst, malnutrition and dehydration. Provision of food and water should be in accordance with the physiological status of organism, lactation, pregnancy and growth, composition and quality of nutrients and climate conditions *(Broom and Fraser, 2015).* Milk production in adult and growing in young animals should be monitored and unexpected changes observed in time *(IDF, 2019*). Consideration should be taken into account that stocking density and feed barrier design affect the feeding and social behaviour of dairy cattle (*Huzzey et al., 2006*). Stockpersons should get acquainted with body condition score and its relation with dairy cow productivity, health and welfare (*Roche et al., 2009).*

Animals should have access to adequate amounts of appropriate food and water to maintain good health in order to ensure physiological and production requirements and reduce metabolic and nutritional disorders. It is essential to provide a balanced meal that ensures the metabolic needs of animals. Water supply must be in sufficient quantity and with adequate access to supplies, appropriate quality as well as regular water control and equipment maintenance. When it comes to young animals, they need to be provided with adequate food for growth (*von Keyserlingk et al., 2009; Broom and Fraser, 2015; Hristov and Stanković, 2016).*

Basically, food and water must not contain any biological, chemical and physical substances harmful to health. Attention should be paid also to toxic plants and chemical substances as well as other harmful substances that can be ingested by animals. Wastewater effluents or chemical substances used for pest treatments on pastures and food must not get into the water or food in any case.

Food should be stored in a correct manner that prevents deterioration and ensures that contamination and deterioration in composition and quality does not occur at all. Changes in nutrition should be introduced gradually and accompanied by effects. The physical condition of animals should be monitored and evaluated in regular intervals, especially before and during parturition time, the peak of lactation and during drying period. Appropriate minimum levels of body condition should be defined, below which urgent remedial actions are undertaken along with veterinary advice. It is also necessary to take into account the presence of fat cows in the herd (*Roche et al., 2009; Hristov and Stanković, 2016*). Nutrition and water supply systems should be controlled in terms of functioning and any problems that arise in time need to be addressed. Where possible, alarms indicating the occurrence of the problem should be installed. There should be a system that works in case of emergency. Special attention should be given to the additions of minerals and vitamins to maintain good health in any case with advice from professionals who know potential deficits or surpluses of micronutrient in a particular geographic area (*Hristov and Stanković, 2016; IDF, 2019*).

Nutrition and water supply equipment should be located in such a way that animals can consume food and water unhindered, and in doing so may be able to express normal behaviour, and in particular to reduce the risk of agonistic behaviour expression. The number of animals per feeder and drinkers unit, as well as pasture areas and food and feed space, should be assessed and communicated in each case (*Huzzey et al., 2006*). This equipment should also be properly designed and constructed to provide sufficient amount of food and water, and in any case to avoid contamination and injuries to animals themselves when consuming food and water. When living on pastures, care should be taken to ensure that there is enough food and water to avoid starvation and thirst, especially during the drought periods of the year when it is often necessary to provide additional food *(Hristov and Stanković, 2016*).

When it comes to young animals, adequate colostrum should be provided, in terms of quality and quantity, and in the case that it is not provided on the farm, adequate replacement of the commercial colostrum (*Relić, et al., 2014*). The first colostrum should be consumed as soon as possible and at the latest six hours after birth. In situations where calves do not allow sucking in pre-weaning period, they should receive liquid food in a way that allows for sucking needs (for example, through teats bucket or the like). Calves during the sucking period should not be deprived of liquid food until the rumen develops sufficiently to use solid nutrients and thus meet the nutritional needs. During the sucking period, especially the newborn calves, should be milk fed at least twice a day to ensure sufficient consumption. Weaned replacement heifers, for further use for reproductive purposes, should have access to balanced, solid foods of good quality from the early age to accelerate the corresponding development of the rumen. Cud feeding can be a good alternative for the development of the physiology of the rumen in weaned replacement heifers that serve as a substitute in reproduction (*IDF, 2019*). Changes in feeding, drinking, and standing behaviour of dairy cows during the transition period should be carefully considered (*Huzzey et al., 2005*). All equipment for feeding young animals should be thoroughly cleaned after use. Food and pastures should be controlled in terms of quality and quantity *(Broom and Fraser, 2015; IDF, 2019).*

Dairy cattle welfare practices and environment

Environment, space, equipment, microclimatic and hygienic conditions significantly influence the welfare of dairy cattle. In our country, there are literature data on relations between rearing conditions, health and welfare of dairy cows were described (*Hristov et al., 2008*), minimum standards in conditions of rearing and welfare of cattle *(Hristov et al., 2007*), influence of rearing conditions

on calf welfare in the first month of life (*Samolovac et al., 2019*), methods of assessment of the conditions of breeding and welfare of dairy cows (*Maksimović et al., 2007*), assessment welfare of cows in free housing *(Hristov et al., 2011*) as well as standards of welfare and biosecurity on cattle farms (*Hristov et al., 2009*) so stockpersons can use them in everyday practice. Also, relation between housing conditions and welfare of dairy cows in Serbia was described by *Ostojić Andrić et al. (2015).*

Primarily, the adequate physical, thermal and psychic comfort of the animals should be ensured. Particular attention should be paid to ensure proper milking parlours and handling yards, shelter and appropriate conditions in the stalls. A detailed plan should be defined for the evacuation of animals in case of fire, earthquake or floods *(Broom and Fraser, 2015; Hristov and Stanković, 2015; IDF, 2019*).

The environment should be designed, constructed and maintained so that it can meet the needs of dairy cattle. Particular attention should be paid to the implementation of activities related to all categories of the animals. Requirements to be provided in the environment, depend on physical and climatic conditions as well as the management system. When it comes to the physical aspects of the environment, special attention should be paid to lying surfaces, feedlots areas and yards, bedding, ventilation, fences and regular removal of manure. Stockpersons should have knowledge about behavioural indicators of cows' comfort, especially active and resting behaviour of dairy cows (*Haley et al., 2000*). Stockpersons should keep in mind that overstocking reduces lying time in dairy cows (*Fregonesi et al., 2007*). Also, grouping and social preferences in calves, heifers and cows should be considered (*Bøe and Færevik (2003).*

Regarding climate factors, special attention should be paid to ensuring temperature, humidity, air flow rates, lighting, low levels of noise and vibration. Hazardous gases in the stalls should be kept in stalls. Social grouping of animals is very important for their well-being. Special attention should be paid to grouping calves in group pens. Animals must not be permanently tethered. When keeping animals in confined spaces, especially newborns in individual boxes, calves should be enabled to lie down, stand up, turn around, rest, and maintain a normal body position and body care without difficulty (*Broom and Fraser, 2015; Hristov and Stanković, 2015; IDF, 2019)*.

Dairy cattle welfare practices, husbandry and veterinary procedures

Dairy cattle should be treated with care and in a consistent manner, taking into account their natural behaviour all the time, minimizing the risk of injury and

distress. In the procedures, special attention should be given to moving the animals from one environment to another, grouping the animals, applying the electric prodders, fixing animals, marking, dehorning, shortening the tail, correcting the hoofs, loading, transporting and unloading animals, veterinary treatments and assisting in parturition. In all these cases care should be taken to avoid causing unnecessary pain, fear and consequently animal suffering (*Broom and Fraser, 2015; Hristov and Stanković, 2016, IDF, 2019).*

In the paper of *Vasseur et al., (2010)* some risks factors in term of welfare have been identified. They include: low use of a dedicated calving pen and infrequent surveillance of calving, no disinfection of newborn's navel and delayed identification and, hence, delayed calf monitoring, risks relying on suckling as a source of colostrum, or delaying and providing insufficient quantities, and unchecked immunoglobulin quality and immunity transfer, dehorning and removing supernumerary teats at late age and without pain control, waste milk given without precaution and traditional restrictive feeding of milk or substitute, weaning targeted on age rather than on concentrate intake, and calves housed individually and in inappropriate housing systems. All these risk factors stockpersons should keep in mind and continuously consider the introduction of good practices in calf management since ensuring welfare is very important in rearing of newborn animals *(Relić, et al., 2014; Broom and Fraser, 2015; Hristov and Stanković, 2015).*

Dairy cattle welfare practices and health condition

For the animals' welfare, health conditions have particular importance, such as: lameness, mastitis, injuries, acidosis, milk fever and other metabolic diseases, diarrhoea and anaemia of calves, respiratory diseases, heat stress, arthritis and contagious diseases (*IDF; 2019*). Welfare and behaviour in relation to disease of dairy cows were described by *Hristov et al. (2015b).* Scientific opinion on the risk assessment of the impact of housing, nutrition and feeding, management and genetic selection on metabolic and reproductive problems in dairy cows can be found in *EFSA (2009b).* Scientific report of *EFSA (2009a)* provides insights into numerous researches on the effects of farming systems on dairy cow welfare and disease. There are numerous papers in our country that deal with behaviour of cattle as an indicator of their health and welfare *(Relić et al., 2012*), key health issues affecting dairy cows welfare (*Ostojić Andrić et al., 2016a*), welfare and behaviour in relation to disease of dairy cows (*Hristov, 2015b*), health and welfare of dairy cows (*Ostojić Andrić et al., 2016c*), dairy cows health parameters in different season - a welfare approach (*Ostojić Andrić et al., 2017*), frequency of behavioural disorders of calves in the first month of life (*Samolovac et al., 2018*)

and the most common health disorders and welfare of dairy cows and calves (*Stanković, 2014*).

In relation to these conditions, advice can be obtained from veterinary experts. Treating dairy cattle by unqualified staff may lead to serious health and welfare problems, which should not be allowed in any case. This can be particularly the case with an inappropriate diagnosis, poor surgical interventions with incorrect and inadequate analgesia and anaesthesia. Farm management plans in place should be in line with relevant national and international veterinary requirements. Viral, bacterial and parasitic diseases should be prevented and controlled through appropriate biosecurity measures, appropriate technological process of production and good management practices including prophylaxis and regularly monitoring. Separate facilities should be provided for diseased and injured animals (*Broom and Fraser, 2015; Hristov and Stanković, 2015; IDF, 2019*).

When it comes to health, stockpersons should have appropriate competencies in terms of identifying the first signs of illness and injury in dairy cattle, as well as the implementation of appropriate standard operational procedures for the health management in relation to the animal welfare in cooperation with the veterinarian. Particular attention should be paid to the daily inspection of animals, especially those who are around the parturition period, newborns and close weaned animals, animals kept in confined areas, animals affected by metabolic disorders, emergencies, outbreaks of contagious diseases, and where economic and psychosocial problems related to dairy cattle exist *(Broom and Fraser, 2015; Hristov and Stanković, 2015; IDF, 2019*).

The animal health programs should take into account preventive measures against abovementioned diseases and injuries, mineral and vitamin supplements in order to prevent deficiencies, supplementation of magnesium and calcium around the parturition period, hygiene of the animals, barns, shelters, loafing areas and yards, pastures and milking parlours, proper nutrition, management of ambulatory animals as well as isolation and prompt treatment of diseased animals. The stockman is expected to implement a detailed biosecurity plan to reduce the risk of introducing and spreading disease on the farm. It is also necessary to introduce a system of records data related to the health protection plan, such as animal identification, morbidities rates, culling rates, reproductive disorders, lameness, incidence of mastitis, incidence and details of preventable diseases and injuries, vaccinations, diagnostic tests and all treatments with withdrawal times for medicines whether controlled by veterinary regulations or not. All aspects related to euthanasia when necessary in diseased or sick animals should also be considered (*Broom and Fraser, 2015; Hristov and Stanković, 2015; IDF, 2019*).

Conclusions

On the basis of the presented data from the literature and the experience of the authors of the paper related general principles and good animal welfare practice on dairy cattle farms can be concluded:

- it is necessary to define a guide which would describe the general principles and good practices for ensuring the welfare of dairy cattle;
- the key action areas in the guide should be stockmanship, feed and water, living environment, husbandry practices and health management;
- the most important issue for the implementation of good welfare practices for dairy cows is stockmanship;
- it is necessary to introduce systematic training of stockpersons in our country with special attention to stockmanship, feed and water, living environment, husbandry practices and health management in order to achieve a stable system of ensuring good dairy cattle welfare.

Opšti principi i dobre prakse za dobrobit životinja na farmama mlečnih goveda

Slavča Hristov, Dušica Ostojić Andrić, Branislav Stanković

Rezime

Iskustva na terenu i naučna zapažanja ukazuju na potrebu definisanja vodiča u kome bi se opisali opšti principi i dobre prakse za obezbeđenje dobrobiti mlečnih goveda koje bi bile široko primenljive. Ključne oblasti u vodiču treba da budu odgajivanje, hrana i voda, životna sredina, zootehnički i veterinarski postupci i upravljanje zdravljem životinja. U svakoj od ovih ključnih oblasti postoji skup principa koji bi trebalo da se koriste za dalje definisanje najboljih dobrih praksi za obezbeđenje dobrobiti mlečnih goveda na farmama. Najvažnija oblast za implementaciju dobrih praksi dobrobiti mlečnih krava je odgajivanje. Odgovarajuća ishrana je osnovni zahtev i smatra se da ima veliku ulogu u obezbeđenju odgovarajuće dobrobiti mlečnih goveda. Okolina, prostor, oprema, mikroklimatski i higijenski uslovi značajno utiču na dobrobit mlečnih goveda. Mlečna goveda treba tretirati pažljivo i na konzistentan način, uzimajući u obzir njihovo prirodno ponašanje sve vreme, a u svakom slučaju umanjiti rizik od povreda i stresa. Za dobrobit mlečnih goveda posebno su važna zdravstvena stanja, kao što su: šepavost, mastitis, povrede, acidoza, mlečna groznica i druga metabolička oboljenja, dijareja i anemija teladi, respiratorne bolesti, toplotni stres,

artritis i mnoge zarazne bolesti. Neophodno je uvesti sistematsku obuku odgajivača u našoj zemlji sa posebnim osvrtom na odgajivanje, hranu i vodu, životnu sredinu, zootehničke i veterinarske postupke i upravljanje zdravljem, kako bi se dostigao stabilan sistem obezbeđernja odgovarajuće dobrobiti mlečnih goveda.

Ključne reči: dobrobit mlečnih krava, opšti principi, dobre prakse dobrobiti

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