

Veal Calves, an Alternative System to Increase the Profitability of Dairy Sectors. Feasibility Study

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Abstract: With the purpose of increasing the profitability of milk producers, a pilot study for the production system of veal dairy calves was conducted. This type of rearing is not practiced in our country at present. The study was carried out in the establishment of “cabaña Alicia” dairy farm, located in the district of Magdalena, province of Buenos Aires. 12 Argentinean Holando breed male non-castrated calves were employed for this study, and they were fed on a milk replacer-based liquid diet, to obtain a pale meat as the final product. This kind of meat is characteristic of Europe and also quite widespread throughout this continent. Fortnightly weighting was performed to control the daily body weight gain (DWG). Finally, the calves were slaughtered six months later, with an average DWG 0.73 kg/day, average BW 181 kg, and beef yield 57.6%; blood iron exams at the end of the cycle resulted in average 7.8 gr/dl, considered within the expected parameters to avoid the occurrence of anemia. Thus, we can conclude that this production proposal, compared to traditional artificial calf rearing, is a convenient opportunity to those producers who can enter the market of this kind of meat, or seek consumption sites in our country.

Keywords: Veal Calves, Rearing, System, Dairy

INTRODUCTION

Milk industry is one of the most important food industries in the country. Primary production in Argentina between 2008 and 2015 reached an average production level of 10,700 million liters, mainly concentrated in Buenos Aires (23%), Santa Fe (28%) and Córdoba (28%) and, in a lesser degree, in Entre Ríos and La Pampa, with around 2 and 1% respectively. The main dairy production areas, and almost all dairy farms and milk industries are located in these provinces (Bisang, Gutman y Cesa, 2003).

The profitability of dairy farm exploitation in the country has been compromised in the last years. This has caused the cessation of the activity in some cases, and the reorientation of the activity in others. Taking into account this situation and, in the need to offer feasible solutions to the exploitation, meat production could be proposed as an alternative to milk production. Also, this proposal can respond to the growing demand of the European market of young calf meat reared in natural conditions.

This production system involves the artificial rearing of calves, which consists of prematurely separating the calves from their mothers, so that cows can be milked. Such artificial rearing system may be

employed collectively or individually, using pegs or in cages. In all cases, calves are separated from their mothers after the calostrum consumption within the first 12 hours of life (12 hours approximately). This is the first food supplied to the calf, and it contains immunologic value. In ruminants, there is no placental immunity during the fetal developmental stage, because the placenta avoids the passage of antibodies from the mother's blood to the fetus (Hazard, 1993).

It is important to point out that general rearing involves female cows, which are necessary for the replacement of productive animals. Males are sold to low prices before or after the rearing period because their reproductive use is limited. A very small number of bulls is needed for natural reproduction and, also, the use of artificial insemination is widely adopted. In addition, being a milk breed, they are undervalued as meat producers. For calves to finish their fattening periods takes a long time, which means a higher cost and this makes them unprofitable.

In Argentina, approximately around 2,000,000 Argentinean Holando calves are born every year, of which 50% are male and 50% female. Artificial

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rearing implies an important cost in our country's milk production systems, and that may affect their profitability, since chances of selling milk breed calves for fattening are quite limited. For these reasons, producers offer calves to the market at low prices, and in some cases, they slaughter them after birth.

An alternative for this would be the rearing of veal dairy calves, to create a differential final product of high added value. As this product is not habitually commercialized in our country, it would be necessary to conduct a market research, and to explore the possibility of exportation. Veal calves are a kind of artificial rearing characterized by having a dairy replacer-based liquid diet. This kind of food allows for a product of differential features, compared to the ones that already exist in the market at present (Vieira *et al.*, 2004).

The peculiarity of the final product is the pale white color of the meat and its particular flavor, very much appreciated in certain markets. The high nutritive value of dairy food allows for a fast growth and an appropriate fat covering. This peculiar color is the result of an iron and fiber deficiency. Iron carries oxygen in hemoglobin and acts on myoglobin (pigment which colors the meat red) provoking this color, because of a lesser amount than usual (Bremner & Dalgarno, 1972).

To accomplish this result, it is necessary to maintain a certain level of anemia, so that it does not alter weight gains, but that it does not change the color of the meat either. Such levels range around 7 and 10 g/dl. Fiber deficiency in the diet prevents the calf to develop the rumen as normal, being the rennet the one mainly digesting the dairy diet. As a result, calves behave as monogastric (Lumsden *et al.*, 1980).

The consumption of this product at a global level is to be found mainly in the member countries of the

European Union, including France, Germany, Italy, United Kingdom and Spain. Within the American continent, the United States consumes 0.2 kilograms per capita, per year. The primary commercialized meat cuts are: leg, tenderloin, short loin, rib, shoulder, chuck and brisket. These are used for the elaboration of high cuisine dishes of an elevated value.

For the exportation of this kind of 'differential' meat, the current regulations affect the price for an exportation right of 5% and there are not reimbursements of any kind. Since they are not considered as 'high quality meat cuts' by the European Union, they are not subjected to quotas (common nomenclature of MERCOSUR 'NCM', Resolution 13/2007). All this leads us to suggest that this 'differential' product may result in an interesting alternative to improve milk systems profitability.

OBJECTIVE

Assessing and comparing some productive parameters of artificial rearing systems of veal dairy calves, individually or in group, using a French protocol.

MATERIALS AND METHODOLOGY

The study was carried out from November 2014 to May 2015, in "cabaña Alicia" dairy farm (Lorentor S.A), located in 36 road, km 78, in the district of Poblet, city of La Plata, province of Buenos Aires. The performed study has been a preliminary test, for the production system of veal calves is not currently practiced in our country.

The trial was based on a protocol resulting from experience. The experience was performed in three stages: start, development and termination. During these stages, the concentration and amount of dairy replacer varied, following the French protocol guidelines (Table N° 1).

Table N° 1: Feeding protocol of Tullet *et al.*, 1981

Starting stage: Feeding program						
Time (weeks)	Concentration (gr of replacer/ kg of water)	DWG	Body Weight	Suggested amount		
				Dairy Replacer	Weekly Intake	Water
1	140	0	45	430	3010	3070
2	161	286	45	555	3885	3445
3	170	610	47	870	6090	5130
4	194	1000	51	1220	8540	6280
Dairy replacer total intake amount 'Start stage' during the four weeks: 21,525 kg.						

Development stage						
Time (weeks)	Concentration (gr of replacer/ kg of water)	DWG	Body Weight	Suggested amount		
				Dairy Replacer	Weekly Intake	Water
5	194	1200	58	1300	9100	6700
6	208	1300	67	1730	12110	8300
7	217	1300	76	1800	12600	8300
8	223	1300	85	1895	13265	8503
Dairy replacer intake 'Development' during the four weeks: 47,075 Kg.						
Termination stage						
Time (weeks)	Concentration (gr of replacer/ kg of water)	DWG	Body Weight	Suggested amount		
				Dairy Replacer	Weekly Intake	Water
9	223	1350	94	2005	14035	8995
10	223	1350	103	2095	14665	9405
11	228	1440	113	2300	16100	10100
12	226	1440	123	2395	16765	10605
13	225	1450	133	2495	17465	11105
14	226	1450	143	2585	18095	11415
15	226	1450	153	2670	18690	11830
16	226	1470	163	2800	19600	12400
17	226	1420	174	2800	19600	12400
18	226	1400	184	2800	19600	12400
19	226	1400	193	2800	19600	12400
20	226	1400	202	2800	19600	12400
21	226	1400	212	2900	20300	12600
22	226	1400	222	2900	20300	12600
23	230	1400	232	3100	21700	13000
24	230	1400	241	3100	21700	13000
Dairy replacer intake 'Termination' during the four weeks: 297,825 kg						

12 Argentinean Holando non-castrated males between the 5 and 7 days of age were employed, with a body weight between 35 and 45 kg clinically healthy and colostrum fed. Calves immunity state was determined by means of a glutaraldehyde test. The aim of this test is to assess the amount of colostrum sucked from their mothers in the first 24 hours of life. The colostrum is the only source of defense that they are able to obtain, for they are born without any kind of antibodies (agammaglobulinemic) (Berra *et al.*, 1997).

The rearing was performed in two group sheds with four animals each, and four individual sheds with sliding doors for good ventilation. As an additional ventilation system, two fans were installed, one on

the floor and another one on the wall, only used in days of high temperature and low wind speed. Group sheds surface was 9.2 m² and individual sheds surface was 4.2 m², each with a trough. All sheds had to be clean, disinfected and dry.

In addition, sheds had wooden floors and sides to avoid animal contact with the ground, in order to improve their wellbeing and preserve their health. Straw or any other material used as bed was ruled out since, if ingested by the animals, it could alter the particular coloring of this kind of meat.

They were fed on an iron and fiber deficient dairy replacer-based liquid diet, designed to produce the peculiar pale color of this meat (Bertrand &

Martineau 1997). The food (Toullec et al., 1981) was supplied individually twice a day (at 6.00 AM and 18.00 PM respectively) at a temperature of 38° C- 40° C. The amount of water was given willy-nilly during the months of highest temperature (December, January, and mid February) and then, only during the morning not to reduce the milk intake.

As regards the work staff, work routines were constant and performed regularly. The movements of the staff around the animals were discrete not to excite them. Also, a permanent control of health aspects was performed, especially on the most frequent pathologies taking place in this type of rearing: diarrhea and pneumonia. Appropriate treatments were applied in each case (Roy, 1972).

Measurements: productive parameters

-Daily body weight gain (DWG). Fortnightly weightings were made during the rearing period using an electronic scale. Once obtained the final weight of each calf, the initial weight was subtracted from that amount and such result was divided by the total amount of days of the study. It should be pointed out that fortnightly weightings were aimed at keeping a closer track of each calf.

-Beef yield: data were obtained from the slaughterhouse in charge of the slaughter.
 -Meat color: an organoleptic assessment was made specifically on the characteristic color of the meat.
 -Blood extraction was performed 100 days after the start of the rearing, and at its termination, in order to evaluate iron levels and control possible anemia occurrence.

Statistic Analysis

Data were evaluated statistically by means of variance analysis (ANOVA) and once the differences observed were proved to be significant, the means were compared by means of Tukey test.

This analysis was performed separately for the two study variables, body weight (BW) and daily body weight gain (BWG). The numbers resulting from the individual and group treatment were analyzed, together with the ones established by the French protocol.

RESULTS AND DISCUSSION

Observing the DWG calculated in the group and individual rearing, we find no significant statistic differences between the treatments (table N° 2).

Table N° 2: statistical analysis of the DWG parameter expressed in gr/day in the group and individual rearing system.

	DWG
P value	0.900000
Group rearing	0.839 a
Individual rearing	0.834 a

Same letters do not differ significantly.

Content in Table N° 3 details initial, final and DWG data, within a period of 182 days. Also, a difference is established between individual rearing calves and group rearing calves.

Table N° 3: daily body weight gain in the whole period.

Sheds	Initial weights	Final weights	DWG kg/day
Group	53.50	196.10	0.78
Group	50.00	188.40	0.76
Group	46.50	201.75	0.85
Group	39.50	185.25	0.80
Group	38.50	104.40	0.36
Group	41.00	174.80	0.74
Group	48.50	165.40	0.64
Group	42.00	163.30	0.67
Individual	49.50	198.90	0.82
Individual	62.00	208.40	0.80
Individual	51.00	208.10	0.86
Individual	43.00	153.90	0.61
DWG average			0.73

The French protocol DWG average in the whole period is of 1.2 kg vs. 0.73 (Table N° 3) of the performed study, the latter being significantly lower, but still considered within reasonable levels.

These differences between DWG might be due to ambient conditions, for Europe has a higher level of control. Given that it can afford to make higher inversions in their systems, Europe is able to improve their animals' wellbeing. Moreover, originally, each country has adapted breeds to local conditions, orienting rearing to different objectives. In this sense, milk breeds of European countries may have been selected to be used for a double purpose. These countries have, therefore, a better aptitude to produce

meat, unlike our country, where animals are mainly specialized for milk activity.

Veal calves are slaughtered between the 2 and 6 months of age with a bodyweight of between 100 and 250 kg. This kind of animal must provide, together with a high beef yield (60% approximately), a well formed beef that is sufficiently fat covered, and above all, a white meat. Contents in Table N° 4 detail the weights of each calf beef with their corresponding bodyweight. This information was provided by the slaughterhouse in charge of the slaughter (FRIGOLAR), authorized by ONCCA, for animals did not reach the allowed weight for slaughter. So, a special permit had to be requested to perform the activity for research purposes.

Table N° 4: beef yield.

Calf	Beef 1 (Kg)	Beef 2 (Kg)	Calf BW (Kg)	Yield (%)
1	40	40	175.3	45.6
2	58	57	188.4	60.5
3	30	31	104.4	58.4
4	50	50	172.4	58.2
5	54	55	185.3	58.5
6	63	62	208.1	59.9
7	58	59	201.8	58.2
8	58	57	196.1	58.6
9	61	62	208.4	59.2
10	59	59	199.0	59.1
11	44	44	153.9	57.6
12	52	51	178.8	57.6
Beef average yield				57.6
Average body weight			181.0	

It is also observed that BW average is 181 kg and the average beef yield is 57.6%. The latter is very close to the optimum one of 60%. Therefore, we may conclude that the result was good.

The characteristic color of the meat was observed and compared to that of a grazing animal. Results of the iron level analysis by means of blood extraction after 100 days of rearing were 8.2 gr/dl average of the 12 calves. At the termination of the cycle the values were on average 7.8 gr/dl. It was observed that these values were considered within the expected parameters to avoid the occurrence of anemia without altering the meat's color.

CONCLUSIONS

Given the particular conditions where this study was performed, it is important to point out that a widely adopted rearing system in other countries, though

never used before in Argentina, was reproduced successfully. It is also worth mentioning that since this system is a new activity, it might be improved in certain aspects. Improvements, therefore, will occur once it starts being adopted in more areas and by more people, so that more information is obtained about it.

The activity of animal protection societies against the distribution of this product is very strict in some European countries, so this should be something to take into account when considering undertaking this activity. Moreover, countries such as the United States overtly disagree with confinement rearing systems. Studies have demonstrated that this kind of system alters calves' behavior, causing psychological and physical damage (Reece & Hotchkiss, 1987).

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