Technology Adoption, Production Performance and Factors Driving Farmers´ Decision Making Process in Beef Cattle Farms in Uruguay

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01. Introduction

The Agricultural Transformation Pathways (ATP) for Uruguay issued in 2016 in the frame of the UN´s Sustainable Development Solutions Network (SDSN) project made relevant advances in setting the desired and feasible goals and development objectives for 2030 (Schoowb *et al.*, 2016).

Beef is one of the main agri-food chains included in Uruguay´s first studies given is the country´s main export, production is the largest in terms of land used (12,6 million ha) and farms involved (44780).

The "backcasting" approach used for "building a vision of the future we want" denotes a process in which a desired target is set for a future date, and then identifies the best pathway towards achieving that target by moving backward in time. Identification of sociological, political and technological roadblocks to overcome to achieve the desired ATP target is part of the SDSN initiative proposed methodology.

This paper aims to understand the relationship among the multiple factors driving farmers´ decision making process as crucial feedback for policymakers and experts selecting the best pathway for sector development. Selected variables are studied to identify the key factors to consider in designing beef sector oriented technological, social and/or financial support programs.

02. Data and analysis

Using data from the National Cattle Farm Survey 2016 (1298 farms) (Bervejillo *et al.*, 2018) the relationship between farm business orientation, farm size, technological level, and production performance was addressed.

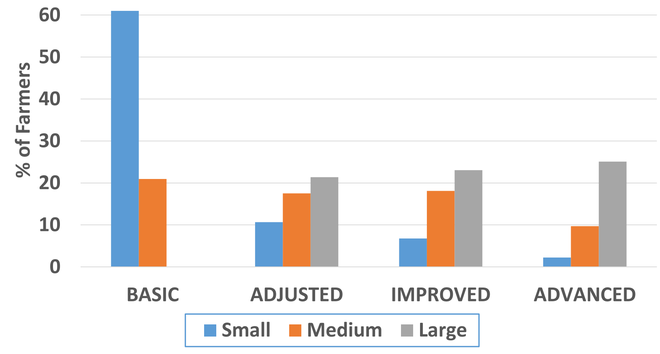
Cattle farms larger than 50 ha, were classified according to their livestock business main orientation.

% of Farmers by size in each production orientation

Production orientation	Small	Medium	Large
Cow calf (CC)	85	13	2
CC + Fattening cull cows	47	36	17
CC + Backgrounding	78	16	7
CC + Finishing	50	25	26
Finishing only	67	24	9
Backgrounding only	61	37	2

A Technological Index (TI) was developed and calculated for each farm using data of application of specific production practices, farm production efficiency indicators and the extension and type of improved pastures in the farm.

Farmers distribution according to technological level for COW CALF operations

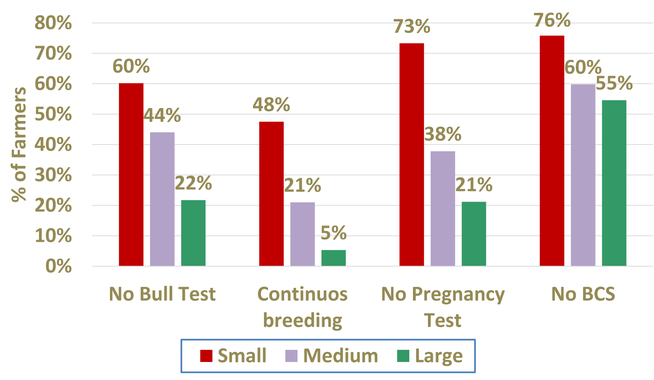


Using modeling tools (Soares de Lima, 2009) and the farms´ technological level it was possible to estimate beef production figures for each farm size group and business production orientation. The economic result for each group, by technological level, using average prices for the last 4 years, was also estimated. In this way, effects on benefits and additional direct costs of moving from one technological level to another, or eventually from one orientation to another are evident.

03. Findings

The survey shows a large number of farms with very low technology level, not applying even the minimum basic management techniques recommended by the national research and extension agencies, even those that do not imply direct effective costs for their implementation.

Frequency of farmers NOT using basic technologies during the breeding process (% of farmers within each size group) according to farm size



A clear association between farm size and technological levels is shown. Small farmers are more frequent in the Basic level of technology and their presence strongly decrease as the technological level increase. The trend is inverse in the case of the large farms with a higher percentage of farmers of this group in the levels of better technology. The trend is not clear for medium-size farms.

Beef production levels per hectare, for each production orientation and technological level were estimated. Production is higher as the technological levels increase and for the production orientations that have a higher overall biological efficiency (F> CC+F> CC+B> CC). The economic result for each group, by technological level, show similar behavior.

Estimated productivity (kg LW/ha) and net revenue (USD/ha) (in brackets) by production orientation and technological level

Production orientation	Basic	Adjusted	Improved	Advanced
CC	44 (11)	77 (67)	89 (72)	98 (74)
CC + Backgr.	56 (23)	71 (52)	94 (87)	100 (81)
CC + Finish.	58 (53)	84 (88)	105 (99)	130 (102)
Finish. Only	90 (56)	116 (73)	171 (92)	239 (132)

04. CONCLUSIONS

Lower response to intensification is observed in the cow-calf (CC and CC+B) operations given that the main system involved is biologically more limited by "energy expensive" processes such as gestation and lactation. Even though, there is an important jump in income when passing from the Basic to the Adjusted technological level, due to an adequation of key production parameters, mainly the animal stocking rate. Farms with the lowest level of technology use (Basic) have the highest winter stocking rates, decreasing significantly in the Adjusted level. Animal overstocking in the farms is one of the most important determinants of poor production performance, in particular on farms that rely on native pasture for animal feeding, and also a key element defining a higher vulnerability to climate change.

This behavior is consistent with the theory that states that particularly for small farmers, cattle is not only a production asset but also a form of wealth accumulation. In particular, it has been said that small farmers perceive cattle as a secure readily available savings fund, being the main cause of the excess stocking rate. If true, this is an important element to be taken into account for the purposes of communication with the producer and in the transfer and promotion of technological packages seeking a production increase.

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