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MODELING ALTERNATIVE TECHNOLOGY ADOPTION TRANSFORMATION SCENARIOS TO ACHIEVE PRODUCTION AND ECONOMIC PERFORMANCE GOALS IN THE URUGUAYAN BEEF CATTLE SECTOR

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Abstract

The Agricultural Transformation Pathways (ATP) for Uruguay and two other selected study cases issued in 2016 in the frame of the UN´s Sustainable Development Solutions Network (SDSN) projectmade relevant advances in setting the desired and feasible goals and development objectives for 2030 (Schwoob 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 and production is the largest in terms of land used (12,6 million ha) and farms involved (44780).

Understanding the relationship among the multiple factors driving farmers´ decision making process is crucial for policymakers and experts selecting the best pathway to overcome roadblocks and reach goals. This paper addresses the relationship between farm business orientation, farm size, technological level, production performance and economic return in the beef cattle production sector. The objective is to understand the main constraints to the adoption of technology and the main factors to consider in the design of future assistance programs. Furthermore, different alternative scenarios of change in technology adoption were considered over the actual situation and modeled, evaluating impacts on the country´s average beef production performance indicators, number of cattle slaughtered and beef sector economic return.

Using data from the National Cattle Farm Survey 2016 (1298 farms) (Bervejillo et al, 2018) Uruguay´s cattle farms were classified according to their livestock business main orientation: cow-calf operations (CC, 42%), cow-calf and backgrounding (CCB, 14%), cow-calf and pasture finishing (CCF, 31%) and cattle pasture finishing only (F, 13%). Within these groups “land extension” was used for further classification as “Small”, “Medium” or “Large” scale farm operations (50-500 ha, 501-1250 ha, and >1250 ha).

As a proxy for the intensity of technology use 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.

Results show a big proportion of Uruguayan cattle farms in the lower levels of technology use (52%), being larger for CC (62%) and CCB (45%) operations. Farms in the “Improved” technological level although less in number, account for 27% of the cattle land of the country, being the rest of the land almost evenly distributed among the other levels (17 to 19% each).

CC farms, in particular, show a strong relationship between farm size and technological level. Small farms classified mainly in the Basic level, with a decreasing proportion trend in the other levels. Large farms, on the other hand, have an opposite trend, with an increasing proportion of farms as technological level improves.

Further analysis shows a large number of farms with a very low level of technology use, particularly in the cow-calf component of the production process. In most cases, even the most basic

and well-knownpractices, with no implementation incremental cash costs are disregarded. Excess stocking rate (Boné&Perugorría, 2011) and lack of facilities for specific technology implementation are main restrictions affecting reproduction and production performance. Small farmers´ perception of cattle accumulation as a denotation of wealth and also as a secure readily available savings fund is the main cause of the excess stocking rate. Consequences are not only lower production performance but also a higher vulnerability at extreme climatic events.

Different alternative scenarios of change in technology adoption were considered over the actual situation and modeled (Soares de Lima, 2009) and compared to the 2030 ATP´s (SDSN) projected goals for the Uruguayan beef sector. Production and economic performance results for each business orientation, and farm size were country-averaged for each scenario.Change in production practices modeled reached in some cases a 30% increase in productivity and 25% in animals slaughtered per year, driven by improvements in reproduction indicators, pasture quality, and availability, and increased supplementation among others. Farms economic return also showed a positive trend while a decrease in GHG emissions per unit of product was projected as a result of better feeding and consequent shorter age to slaughter.

However, results show that important changes in the level of technology use are needed to achieve a meaningful impact on the country´s average performance indicators for the beef sector. Modeling results show that when seeking higher productivity,efforts should focus on farmers with more than a basic level of technology use. Alternatively, welfare concern and other supports should focus on a relatively large number of small cow-calf operations with a very basic level of technology use and limited impact on the sector´s productivity.

Keywords: Sustainable Intensification, SDSN, Technology Adoption, Livestock Production Modeling.