Development of a Livestock Production Performance Database for Policy Planning and Evaluation in South and Southeast Asia

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Introduction
The demand for quantitative tools to assess the potential impact of policy measures in the livestock sector has increased considerably. Accordingly, FAO has developed the Livestock Development Planning System Version 2 (LDPS2) (LALONDE AND SUKIGARA, 1997), a spreadsheet-based herd productivity calculator as a generic tool for livestock policy planning and evaluation. It can provide estimates of herd growth plus off-take of meat and milk over a projection period of 20 years, based on the input of herd productivity measures and management parameters. LDPS2 focuses mainly on large and small ruminants (dairy cattle, beef cattle, buffalo, sheep and goat), but also includes pig and poultry components. One of the major development objectives was keeping the model as simple as possible and including only major measures and parameters to limit data requirements. Nevertheless, its wider application has been constrained by the scarcity of available input data, despite countless studies on livestock performance and productivity having been conducted and published over the past decades. Yet, no concerted effort has been undertaken so far to compile, classify and aggregate this information with the specific aim of making it available for policy planning and evaluation. Therefore, FAO conducted a preliminary study by collecting relevant production performance values from the literature for ruminants in sub-Saharan Africa (OTTE AND CHILONDA, 2002). To extend this approach globally a database was required as a repository for the values themselves, their references as well as additional classifying variables required for useful aggregation. Thus, FAO initiated the development of the Livestock Production Performance Database (LPPD).

Material and Methods
LPPD is a MS Access based database and includes performance parameters for 8 livestock species; with camels being included in addition to the species mentioned above. All productivity measures and management parameters required by LDPS2 are also defined in LPPD. They are grouped into the following parameter classes: Draught, fertility, herd structure, lactation, laying, management policies, mortality, weight and wool/hides/skin. The total number of parameters defined currently stands at 560. Species, sex and age group are included in the parameter definition (e.g. "average live-weight of young female beef cattle") as well as the unit.

When entering a new data record, its literature source has to be identified first by assigning the record to a previously registered reference. Subsequently, the appropriate performance parameter is selected, according to species, sex, age group and parameter class. Then the appropriate values of additional variables are selected, such as livestock breed, geographic location (global region, country and geographical co-ordinates), production system, agro-ecological zone, study type and study quality (reliability, sample size households and animals included in the respective study).

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Finally, the new data record is completed with entering the actual value of the parameter, generally a mean value derived in a field study. Its unit is already defined with the parameter.

The additional variables mentioned above are of major importance when aggregating the entered values. Thus for instance, dairy cattle milk yields should not be aggregated without considering agro-ecological zone and production system. Within LPPD five global agro-ecological zones have been defined, according to the Global Agro-Ecological Zones (GAEZ) system developed by FAO and based on previously developed concepts (FAO, 1996), with length of growing period being the main differentiating factor. The definition of production systems within LPPD focuses mainly on land-use differences (grass-land, mixed rain-fed, mixed irrigated and landless) (SERÉ AND STEINFELD, 1996). However, an additional classification step, degree of commercialisation, is introduced, to differentiate between market- and subsistence-orientated livestock production.

The database provides forms for manual entry of references and of parameter values. However, reference entries can also easily be imported from any reference software.

LPPD offers two output forms. The first produces a set of aggregates (count, mean, median, minimum, maximum and standard deviation) of individual parameters as well as means and ranges of underlying sample sizes (both households and animals). The data set on the basis of which these aggregates are calculated may be limited by most of the previously described additional variables. In addition, range of publication year may also be used as a filter. In the second output form the produced aggregates are only mean, median and count, allowing the same variables for filtering data sets. However, this form produces a table of all parameter aggregates required by LDPS2 for all relevant species. The number of parameters required by LDPS2 is 59 for large ruminants, 50 for small ruminants, 34 for pigs and 26 for poultry. As the sequence of parameters has been co-ordinated the data table may be copied directly into the data input work sheet of LDPS2.

LPPD allows for decentralised data entry, as long as the structure of the database is generally accepted. So far, expert groups have collected performance parameter values from four regions: Sub-Saharan Africa, Far East (Asia), North Africa and South America. In this presentation the focus will be on results and experiences of compiling literature data from 9 countries in South and Southeast Asia: Bangladesh, India, Nepal, Pakistan, Sri Lanka, Cambodia, Lao PDR, Thailand and Vietnam. In this presentation the focus will be on results and experiences of compiling literature data from 9 countries in South and Southeast Asia: Bangladesh, India, Nepal, Pakistan, Sri Lanka, Cambodia, Lao PDR, Thailand and Vietnam. The performance parameter values were retrieved from both regular publications and "grey" literature, i.e. reports with a limited audience, obtained mainly through direct contacts within the respective countries.

**Results and Discussion**

Currently, the total number of parameter values entered into LPPD for the 9 countries in South and Southeast Asia stands at 6646, derived from 456 references. However, many identified values of required parameters were not entered as the references did not provide sufficient information to assign them to specific parameters, for instance because the age group was not defined. Also, a large proportion of references did not give relevant information on location and context so that values of additional variables, such as production system or agro-ecological zone, could not be assigned. Of all entered values 18% have no production system and 5% have no agro-ecological zone attributed. Therefore, these values are not considered when calculating specific aggregates.

The availability of information varies greatly between countries, species and parameter classes. Regarding the distribution between countries (Figure 1), more data is available from South Asia, than from Southeast Asia. However, Vietnam is the country with second largest contribution to LPPD after India. In regard to species (Figure 2), information on ruminants is generally more abundant than on non-ruminants. However, beef production does not play an important role in the region and therefore does not figure prominently in the literature. Within species, South Asian countries are the main contributors towards information on ruminants. This is especially pronounced regarding small ruminants, for which hardly any information is available from...
Southeast Asia. However, this region provides most of the records on non-ruminants, i.e. pigs and poultry.

Figure 1: Number of records entered into LPPD from South and Southeast Asia by country

Figure 2: Number of records entered into LPPD from South and Southeast Asia by species

The distribution of records amongst parameter classes (Figure 3) shows a strong concentration on weights, lactation and fertility; including 70% of all records. Despite many studies reporting mortality rates only 8% of all values refer to mortality, as often essential additional information, such as respective time period (required for standardisation) or age group (required for identifying the correct parameter), is not reported. Information on herd structure and management policy, such as "age at culling" or "time kept in replacement herd" (e.g. as heifer), is also only rarely reported, despite its importance regarding herd productivity and potential output.

Differentiating by level of commercialisation proved to be especially important for poultry as industrial production systems have gained considerable market share in most study countries. Out of the 639 poultry performance parameter values included in LPPD, which show a production system, 120 refer to commercial while 519 refer to subsistence production systems.

Determining the optimal level of disaggregation when producing output datasets for use with LPDS2 requires a trade-off between minimising missing values (i.e. only little disaggregation) and producing relevant aggregates (i.e. disaggregating by as many important factors as possible). For overall reporting parameters are currently aggregated at the sub-regional level with a simplified production system classification. However, parameters or countries with a sufficient number of values may also be compared individually.
In order to validate the estimations obtained by LDPS2 calculations based on LPPD data, these estimations are compared with country-level data from the Global Livestock Production and Health Atlas (GLiPHA) also produced by FAO and based on FAO-STAT (CLEMENTS ET AL., 2002), for countries where sufficient information is available. In general, the correspondence is fairly good, in some cases very good. For instance, the growth of sheep populations in India and Pakistan are estimated at 0.7% p.a. by both database systems.

Conclusions and Outlook

LPPD has proved to be a useful tool for the systematic compilation of literature data. As structure and output format are designed for integration with LDPS2, the collected values may easily be used for policy analysis and evaluation. However, the compilation of literature values has highlighted the areas, both regional and in regard to species and parameter classes, for which information is still scarce. This should be considered when planning of future studies. The study also highlighted the incomplete description of production location and system in many references, making it difficult to utilise the reported values for further analysis. On the other hand, the strict standards applied during data selection resulted in a data set, which can be easily used for modelling purposes, such as predicting developments of national off-take with LPDS2.

Improvements of the database could include the possibility of combining several values of additional variables for filtering records (e.g. all grass-land systems or all mixed crop-livestock systems) to increase flexibility in producing output datasets. As most records also include geographical co-ordinates it is possible to link LPPD to other GIS-related databases, allowing for further analysis of livestock development. Finally, LPPD is so far only available within FAO and the respective expert groups, due to the local nature of MS Access. The utility of the database will improve greatly by making it accessible via the internet. This is expected to increase the use of LPPD output as well as number of contributors to the collection of literature values.

References


