Socio-economic and technical assessment of the farming systems and rural households: typological techniques

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1. An assessment at rural household level: principles and purposes

Previous chapters have stated that assessment may focus on different theme or activities on the farm. In the same time, different hypothesis and theories can be mobilised at outset. Hence, before setting up any assessment, the demand, its origin, the problematic and the questions arising from the farmers, the rural communities, the development operators, etc. should be clearly identified.

The aim of assessment at farm level will first of all be the analysis of the practices and of the decisions by farmers that determine the overall operation of their household. This analysis is then used to understand their motivations and strategies. The evolution of the holdings is highlighted, with attention paid in particular to their future and the conditions for their sustainability. Finally, as in all assessments, an effort will be made to reveal the problems and difficulties encountered by the farmers in the management of their holdings. As the latter are neither standard nor homogeneous, their diversity should be examined through various methods.

Assessment at this scale is particularly useful in the following areas :

- in the preparatory stage of a development project aiming at promoting technical change and improving farming systems (*e.g.* targeting research and/or extension programme) ;
- or conversely, in assessing *ex post* the impact of such programmes at farm level (or more generally for monitoring purposes) ;
- in operations providing farm management recommendations ;
- in adapting advice and technologies to the diversity of farms in extension, training and technical advice programmes…

The latter fields of application refer to advice purposes at farm level. They focus more comprehensively on practices and decision-making processes. Whereas the two first fields of application refer more to region level, and to rural development planning purposes. they aim at highlighting the main traits of the operation of farming systems, its diversity.

The techniques of practices analysis and building-up of advice and technical change proposal will be developed in chapter 5. Thus, this chapter is dedicated to the assessment of the diversity of rural households' operation and strategies.

Beyond these general terms (operation, strategies), one has to answer different questions :

- What are the determining factors of the choices made by farmers (opportunities and constraints, main goals, etc.) ;
- How is the farm steered on long term basis (rules for strategic decisions) ;
- How is the farm operating on daily or short term basis (practices and rules for action, time and space allocation and management patterns for labour, products, money, etc.) ;

- How is the social system interacting, inside the farm, and outside (actors' logic, social environment role, etc.) ;
- What are the outcomes of the operation (economic, technical, social, environmental impacts).

2. Rural households' typologies, why and what for ?

2.1. Generalities & specificity

> ***Typology*** *(definition from Jary & Jary, 1995, Dictionary of Sociology, Collins publ.) :*
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> *"Any classification conceptual scheme. It may or may not be exhaustive within its empirical frame of reference. The role and utility of any typology is relative to the theoretical or practical perspective within which it is formulated."*

The term "typology" designates both (i) the procedure that leads to the building up of types, designed to help analysis of a complex reality and to order objects which, although different, are of one kind (household for instance), and (ii) the system of types itself resulting from this procedure[1].

The use of typologies has a long lineage in sociological analysis. Typologies have been used in rural sociology primarily to distinguish the social and economic characteristics of farming. Even within this specific focus, however, farm typologies differ in terms of :

- the unit of analysis (*e.g.* the farmer, the farm household, the farm business…),
- the criteria for classification (*e.g.* types of land use practices, household livelihood strategy, structural aspects of production…),
- their analytical purposes (*e.g.* to identify the relationships between farmers, to forecast the impact of an agricultural policy, to prepare an extension/training programme…)

A typology is usually an attempt to group activity units according to their main modes of operation and their common characteristics. This allows the definition of recommendation domains for technical advice or training purposes. But, further to this, typologies can give the decision-makers at region level an useful picture of the diversity in the socio-economic fabric. They can also become frameworks to extrapolate (or conversely to seek) local technical references.

In intensive production contexts, typologies usually focus on farming systems, modes of operation and farmers' strategies (Perrot & Landais, 1993 ; Landais, 1998). They tend to be extended to rural households in the context of developing rural areas. Since the diversity first originates from modes of activity and sources of income (farming, non-farming, off-farm activities) it is therefore difficult to properly highlight the modes of operation and the strategies (Perret, 1999).

Within the framework of rural development support projects, one can say that designing a typology will imply grouping and describing the households with similar needs, with regards to the project's objectives.

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[1] *Further readings on typological techniques : Perrot, C. & Landais E. (1993). Research into typological methods for farm analysis. The why and wherefore. In : Systems studies in agriculture and rural environment. Brossier et al., editors, INRA publ., 415p. (pp 373-381) ; Perret, S. (1999). Typological techniques applied to rural households and farming systems. Principles, procedures and case studies. University of Pretoria / CIRAD, working paper 99/2, 35p. ; Landais, E. (1998) Modelling farm diversity : new approach to typology building in France. Agricultural Systems, 58(4) : 505-527.*

The specific overall approach proposed is to merge the scales, (in time and in space) from the identification of the diversity of rural livelihoods and activity at community level, to the daily practices at plot/flock level, through the operation of the whole farming area, then returns back to a grouping exercise at regional level (typology) and to a historical and prospective study of the trajectories.

In the farming household typology, it is taken for granted that one must study not only the variety of farming activities, but also the variety of farmers' practices and strategies. A distinction is made between a structural typology, i.e. the factors of production and how they are managed, and a functional typology, i.e. the decisions taken by farmers, given the constraints and their behaviour in view of climatic fluctuations and the changing socio-economic circumstances.

Farm typologies based on the operation of farms represent a real investment for local development. This is particularly due to the various functions they can accomplish. Thus, they provide a useful picture of local or regional farming activity for decision-makers in guiding development projects. They can serve as a framework for group analysis (Mettrick, 1986). And lastly, they can play an essential role in providing individual advice to producers. However, as stated previously, increased advice and support to technical change support should be based on a comprehensive analysis of farmers' current practices, action models and decision-making processes (Perret, 1999). That is why a second phase is usually developed, targeting more comprehensively technical, institutional and micro-economic issues (see case studies).

2.2. The steps of the assessment

There are different ways to implement this kind of approach. None of them are recipes as the practical procedure carried out will be highly dependent on context, demand and objectives. However, one can identify several unavoidable steps in the assessment procedure (Perret, 1999) :

- Formulation and understanding of the demand, and/or of the problem situation to be dealt with ;
- Identification and demarcation of the area ;
- Collection of relevant data with regard to the area and identification of the main characteristics of the agricultural systems as well as the socio-economic circumstances at regional level ;
- Choice of a range of households to be assessed (sampling phase) ;
- Collection of information in a homogenous manner (questionnaire and interviews) ;
- Processing of this information (meaning keyboarding, sorting, storage, analysis…) ;
- Modelling the operation of the households and also the identification of main criteria together with the factors of evolution ;
- Grouping the farming households in several types, according to these criteria and factors ;
- Drawing-up the historical trajectories of the groups, and the possible future trajectories, identification of links between types, roles at community/region level…
- Feedback to the community and to development operators, validation of the typology, exchanges with those not included in the sample.

Several essential steps of this overall procedure need to be detailed (Perret, 1999).

2.2.1. Sampling

The sampling phase is essential and tricky.

Sampling for typology is basically a non-probability sampling method. As typology procedure is not a census, the selection process tends to avoid the methodological illusion of statistics and of sampling representativeness according to demography or space size, but favours the criteria of diversity, consistency and relevance to the purposes. However, part of the sampling process relies on the existing data about agricultural activities in the targeted area. In the absence of these data, the sampling process should not replace them, and must rely upon other elements. A search of the quantitative representativeness of each group (or type) defined should occur at the end of the procedure, as a related outcome.

The sampling process for typology use can be seen as a mixture of targeted and overall sampling (according to local statistics, to some key persons' advice, to the purpose of the study, etc.) and of random route sampling, since one can add to the sample some households chosen by chance. At local / community level, an exhaustive survey can also be undertaken on account of a limited number of households (no sampling).

Size of the sample

"The larger the sample the better". *Beyond this general rule, the operator must find the proper balance between the expected accuracy of the outcomes and practicalities (feasibility of the interview phase, manageability of the data collected…) and try to take advantage of the non-probability sampling. Some more definite guidelines can be formulated.*

A population of rural households differs according to a wide range of variables, which variables can differ from on population to another. A population of household is likely to be statistically "normal" for one variable or another (yearly total outcome, number of sheep kept…). But, as typological techniques refer basically to a multi-variables analysis, it becomes complicated if not impossible to determine statistically and accurately the sample size from standard methods.

The following guidelines can be suggested when selecting a sample size for human sciences type of study (for probability sampling):

The larger the population size[2], the smaller the percentage of the population needed to get a representative sample ;

For smaller populations (N<100) there is little point in sampling ; survey the entire population ;

If the population size is about 200, 70% of the population should be sampled ;

If the population size is about 500, 50% of the population should be sampled ;

If the population size is about 1500, 20% of the population should be sampled ;

Beyond 5000, a population size is almost irrelevant and a sample size of 400 will be adequate.

The space patterns and the objectives of a typological study strongly sway the sampling process. At a rural community level, one hardly reckons more than 500 households (first case study). Whereas, at region level, the study may address much more (see second case study).

These guidelines are fully relevant for random/probability sampling. At a community level, previous works show that it is possible to limit the sample size (Perret, 1999) :

- *Only 20% of the households may be surveyed, provided sampling is reasoned, in order to cover the overall diversity,*

[2] *Attention : "Population size" meaning the total number of households in a given area (statistical and not demographic meaning of "population", we are not talking about the total number of inhabitants).*

- *However, for a satisfactory grouping phase, it is necessary to survey at least 80 to 100 households.*

Of course, the purpose is to identify a range of farming households reasonably representative of the different farming systems. But it is not the main goal, since the basic principle is to seek out the maximum diversity. Landscape reading and understanding can help, the assumption is that agro-ecological variations (seen in the landscape) sway the uses and practices. At the same time, a significant difference in farmers' practices within the same agro-ecological unit reveals different types of operations and strategies.

2.2.2. Building-up a questionnaire

A questionnaire is a written instrument used in a formal survey to obtain information that is susceptible to analysis. It has to be standardised so that the answers of different interviewers are comparable. This means that the questions have to be formulated precisely and put in the same way to all the respondents in the sample. This will also make further processing and analysis simpler.

Each new assessment needs the building up of a new questionnaire because each survey has its own specific needs, purposes and context.

The questionnaire should be arranged in blocks of topics so that there is a logical flow in the interview. It usually starts with easy questions (*e.g.* demographic information), and finishes with more sensitive ones (*e.g.* income flows). Layout should be organised in order to fill the answers quickly, with enough space to allow easy reading and further analysis.

"Pre-coded response" questions are very useful, especially while one refers frequently to them during the interview (e.g. members of the family). It is preferable to use "open-response" questions. But for practical reasons, it is advisable to mix them up with "multiple-choice-response" ones (restricted time for interview, the risk of shifting to an interesting but unproductive informal discussion, etc). The idea is to avoid leading questions and suggested answers, but to mobilise a previous knowledge of the range of possible answers.

Examples :

"Do you treat your sheep ?" Yes / No

"How ?" (inoculation, dosing, dipping, other ?)

Who ? When ? Where ? etc… (according to the degree of precision requested)

It is essential to put questions as simply as possible and to use clear, unambiguous concepts. It can be necessary also to use local concepts and terminology.

Once the questionnaire has been written, it is a useful discipline to go through it and justify each question in terms of how the information it yields will be used. At this stage, one has to make sure that all questions are relevant with regard to the "problem" situation of the targeted area, to the conditions of agriculture and to the purposes of the survey.

One has to try to anticipate the problems that will arise during analysis (e.g. are all variables clearly defined, are all units clearly stated, is the form of each product clear, do all the members of the survey team have a uniform set of concepts, etc.).

Most of the time, one must limit the length of the questionnaire. Even though it could seem somehow incomplete or not exhaustive, choices and arbitration are requested to avoid "respondent-fatigue (and "interviewer-fatigue").

The interviewers' team may usefully test the questionnaire, interviewing each other, before real interviews (duration, fluency of questions, easiness to understand, to read, to fill up…).

2.2.3. Carrying-out interviews

Interview itself is an art best learnt by experience. Most of the advice and guidelines that might be provided are not more than good manners and common sense. One must remember that respondents are often more sensitive to the personality of the interviewer than to the questions asked. The initial approach to the farmer and its family is crucial.

The protocol can be essential in most countries. It is often wise (and useful) to go through the local authorities (be they political, ethnic, tribal, administrative, village headman, etc.). Previous groups meetings may be organised to explain the purpose and procedure of the survey to the community and to the local authority. One should try not to arrive in an ostentatious way (show of with clothes, means of transport, manners, etc). The interviewers should explain who they are, who they work for and what is the purpose of the survey. The expected results should be addressed, and one has to be clear about the possible outcomes for the farmer. He/she should be told frankly whether there will be or not direct benefit to him/her. In any case, (i) the respondent must be persuaded that the survey is important and that it is worthwhile co-operating, (ii) a form of feedback should be organised to report the whole information and analysis back to the interviewers, and (iii) one should stress that all answers are confidential, that all filled questionnaires will remain anonymous.

The interview team must remember that farmers are usually busy and must adapt the schedule for interviews to farmers' availability. Most of the time, interviews must be limited to 90 minutes. It is far more interesting and productive to come back to the farmer 2 or 3 times, for precision, completion of the interview, than to excessively draw out an interview (exhausting and boring for the farmer, and jeopardising interviewers' credibility).

It is important to thank the interviewee for his/her co-operation at the end of each interview.

All the members of the survey team have to ask the questions and to write down the answers in the same way. During the interview, it is important not to focus on the questionnaire, but to show the informant that what he/she says is central. That is why it is advised to carrying out interviews with 2 operators, one asking questions (trying to keep the discussion as natural and relaxed as possible), and one noting, filling the questionnaire, possibly asking for precision.

2.2.4. Data processing, grouping exercise and modelling farms' operation

The regular output of such interviews is a stack of 80 to 100 questionnaires (around 20 pages each) per community. This amount of information cannot be comprehensively analysed as it is, nor shared or sustainably stored.

The use of a computer and of a spreadsheet programme for processing purposes is advised. It requires proper coding of the information. This allows easy storage, sorting, sharing and analysis of data. The data capture itself (keyboarding) forces the operator to study thoroughly each and every questionnaire, and then to build up his/her own vision of the diversity and of the possible typology. And finally, it allows processing, creation of new data, calculated from others, and statistics when necessary.

The main idea underlying the grouping is to overpass the structural components of the farm household and to address its operation. For each farm of the sample, one must answer the question as to how it works, where do the farmer and his/her family wants to go, how do they manage to do so ? The following guidelines can be proposed :

According to what have been seen in the community, of surveyors' knowledge of the area, of some available secondary data, a list of the major variables can be built-up. These variables must actually account for the diversity of the farming systems and households surveyed. Depending of the targeted community, these variables may be :

- mainly structural or related to the farm overall operation, when a community or a village were targeted, with an important inner diversity in structures, activities and farming systems, (e.g. level of income,

main source of income, major productive activity, ratio farming income / welfare income, ratio on-farm activities / off-farm activities…) ;

- mainly technical, related to the modes of operation and strategies within a specific farming system (size of the flocks, mode of connection to market, crop rotation features, calendars of activities...).

Two or three (can be four…) of these variables are chosen, consistent one to another, and split into 2 to 4 modalities, so that adding the variables would provide 6 to 10 possible modalities (types).

A "manual" way may be usefully combined with a "computer-supported" procedure.

To begin the grouping phase, it is wise to proceed step by step, the first steps aiming at a general view without much precision. All the sample (filled questionnaires) should be browsed quickly, each farm looked upon briefly. Only the main traits of each farm are noted down, focusing on the way they operate (or on structural traits at least). Farms / households are shared out in different types (6 to 10). It is important to identify roughly each type, naming it (*e.g.* "those with much cattle", "those who market significantly their crops", "those who have off-farm activities", "the poorest ones"…).

Keyboarding of the information and capture on a spreadsheet programme can be undertaken at this stage. It requires proper coding of the information, as the final data stored would be either codes (binary -yes/no, false/true, 0/1- or letters –multiple choice-) or numbers. The design of the worksheet for data capture requires a good knowledge of the questionnaires and of the kind of answers that were collected. Thus, the data capture would preferably be undertaken after the first step described above. Automatic sorting can be carried out, using the series of key variables. This generally refines the previous and rough classification.

As a second step, a more in-depth study can start up, within each type. It is necessary to go more in detail in the questionnaires and to try to challenge the consistency of the whole group, to find similarities and differences, relying more on the strategy underlying each household. At this stage, some households may shift from one type to another. One has sometimes to create a new type, or to remove one, grouping two in one... Many farms' allocation and exchanges between groups may occur during this phase. Choices, arbitration and hypothesis are part of the procedure, as long as they are clearly stated, discussed and validated by the survey team.

At this stage, if it seems to difficult to find any consistency in one group, one can try another one, and be back later on. If it is too difficult to find any consistency in every group, it means that the initial variables were not relevant. The analysis process has to be reset up.

Once the different types are established, a short report (a kind of a generic monograph) is to be written down, aiming at a synthesis of the main common traits of each group, but also of inner differences (structural aspects, main activities, main sources of income, main strategies and modes of operation...).

At this stage, it is interesting to deal with statistics. First is the need to clearly show the traits of each types, though descriptive statistics (tables, pie charts, bar charts…).

Also, statistics can help confirming the consistency of the typology. For instance, a multivariate analysis of variance can be carried out. The F-test is an analysis of variance test, carried out for a range of variables that characterise the different types. The tested hypothesis is that there is no difference in the means in all the different types with respect to the variables under consideration. Thus, the lower the significance of F, the higher the likelihood of rejecting the hypothesis. With regard to the "social science type of survey" that generates data, the accepted value of significance of F is quite high, about 10%. This means that if the significance of F is 0.01 or 10%, one is 90% confident that the hypothesis is not valid (meaning that the types are indeed different).

As a preliminary model aiming at helping the analysis, a simple sketch can be drawn up, summing up the way that the farms operate (links between structural components, flows, relationships, etc.).

The last step should find out and highlight the main characteristics of each group, as clues, key-indicators, in order to ease the use of the typology by other operators, for further applications. For instance, these key-indicators should allow the allocation to a given type of any farm (not included in the survey sample).

Since a typology survey is not similar to a census, the tricky part of a typology (sometimes forgotten) is to identify key indicators for each group. As such it enables the easy allocation of any peculiar production system of an area to a type, with a reasonable degree of certainty.

The size of each group of farming households is assessed as well as the relative importance of their specific problems at regional level. This is carried out with the help of secondary data, and key persons. This also allows priorities to be determined.

A further refinement is to add a political economic dimension. After defining groups of production or livelihood systems, a study is made of the competition and complementarities between them, according to markets (labour, land, products…), extension services, agricultural policy, etc. Consideration of the conflicting interests of different groups leads directly to the definition of priorities.

Another aspect to consider is the dynamics of the systems. The history of the different livelihood and/or production systems may be studied with regard to their strategies and each of them placed on an evolutionary trajectory, according to time and to factors. The different trajectories link the types.

Another kind of analysis can be developed by locating the different types of farms on a graph according to two major criteria or factors accounting for their different strategies (it can be the ratio of agricultural income / gross income in the household, the level of diversification, the rate of subsistence cropping / market orientated cropping, etc.).

This highlights the main mechanisms and factors explaining the shifting from one group to another. The possible evolution of each group, together with the factors involved gives a good prognosis of such developments as well as a simplified representation of the livelihood and agricultural systems and its operational results from this analysis.

3. Typologies : scope and limits

3.1. Comparison with RRA/PRA-style techniques

One must acknowledge the numerous common traits between typological survey and RRA. They both borrow much to anthropological survey techniques (Chambers, 1994). Recent typological works have shown to be as quick as RRA-style studies can be (see case studies).

However, certain differences must be underlined. Typologies are representations of the reality, built up as models by the researchers, whereas RRAs attempt to give an idea of this reality according to actors' viewpoints. In fact, the purposes and scope of each technique differ. Thus, they can be complementary to each other.

Because they were initially designed to address comprehensively the modes of operation in farming systems, typological techniques are very meaningful representations to identify the constraints weighing on the development of the rural productive systems. RRAs generally cast their net wider, addressing many different issues at local level (*e.g.* health, education, infrastructures…) but often less comprehensively.

Hubert (1993) carried out both kind of survey in a similar area in Burundi[3], and showed clearly that RRA bears undoubtedly the mark of pragmatism. Although it is more cost and time effective, it generates an amount of useless information due to their poor reliability or representativeness. On the other hand, the "in-depth" survey takes more time but generates more reliable data. In addition, certain trends and results found out through the RRA were refuted by the in-depth survey (weigh of certain constraints, emergence of certain problems, etc.). Jouve (1992) invokes the brevity of RRA/PRA declarative surveys, as the source of incomplete information ("*the tip of the iceberg*").

Among "in-depth" surveys, typological methods are peculiar, as they have borrowed some ideas to RRA. For instance, the researchers themselves carry out the interviews, the interview questionnaire tend to focus on the main issues farmers have to cope with, etc. Typological works are generally clearly demand-driven, and tend to operationality.

Chapter 3. has already elaborated on the possible connections between typologies and zoning techniques.

3.2. Limits and precautions connected to typologies

The typological techniques aim at drawing up representations of reality. This representation is a sort of a model, providing a simplified idea of the complexity. It is not the reality itself.

Even though using two major variables for type discrimination (for instance on a graph), all types may overlap and seem to be mixed up. This underline different elements of procedure :

- A typology, as a grouping exercise, is basically a multi-variable analysis ; at least 3-4 essential variables must be used for a clear discrimination of types ;
- The use of average data allows representation and synthesis, but often disguises reality ; then, it should occur only at the very end of the analysis, as a way to represent and clarify, not as a mean to analyse ;
- Admittedly, there is a diversity inside each and every type ; they are not homogeneous ; the idea is not to remove or ignore it but to explain it ;
- The limits between types are often overlapping, according to such or such variable ; the evolution of each type (trajectory) is an on-going progressive process, and not only the overstepping of thresholds and stages ; this aspect of rural development is evidenced here.

Finally, it is very important to underline that any typology remains relative and questionable. From the same sample and the same questionnaires, different typologies may be built up, according to the objectives, viewpoints or prospects of the surveyors (see an example mentioned by Perret, 1999).

Two case studies are proposed later on. The objective is to underline the differences between household typology and farm typology, and to give vivid examples of procedure and utilisation of typologies within development-support programmes.

[3] *Hubert, J.P. (1993) Deux types d'enquêtes chez les paysans du Burundi. Les Cahiers de la Recherche-Developpement, 33 (1993) : 41-48.*