



Food and Agriculture Organization  
of the United Nations

# Literature Review Report and Proposal for an International Framework for Farm Typologies

Publication prepared in the framework of the  
Global Strategy to improve Agricultural and Rural Statistics

September 2016

Typology-Based Tools for Classification of Agricultural Holdings

**Literature Review  
Report and Proposal for  
an International Framework  
for Farm Typologies**

Drafted  
by

**Silvia L. Saravia Matus**

with support from:

**Marie-Aude Even**  
**Neli Georgieva**  
**Jean-Francois Giovannetti**

# Table of Contents

<b>List of Figures.....</b>	<b>6</b>
<b>List of Tables.....</b>	<b>7</b>
<b>List of Boxes.....</b>	<b>8</b>
<b>Acronyms and Abbreviations.....</b>	<b>9</b>
<b>Executive Summary.....</b>	<b>10</b>
A. Main findings of the literature review.....	11
B. Proposal for an international framework for agricultural typology.....	24
<b>Introduction.....</b>	<b>37</b>
Global context and rationale for the development of guidelines.....	37
WAW work, past and ongoing.....	38
Developing the guidelines.....	38
Objective and scope of the literature review.....	40
<b>1. What is a Typology?.....</b>	<b>43</b>
1.1. Definition of “typology” and “type”.....	43
1.2. Typology construction approaches and related methods.....	44
1.3. Theoretical challenges to typology building.....	50
<b>2. Overview of Agricultural Typology Exercises at the National, Regional and Global Levels.....</b>	<b>61</b>
2.1. Overview of agricultural typology exercises at the national level.....	61
2.2. Overview of agricultural typology exercises at the regional level.....	69
2.3. Overview of typology exercises at the global level.....	79
2.4. Capturing transformation and ensuring comparability using a typology-based tool.....	103
<b>3. Data Sources: International Data Frameworks and Typologies.....</b>	<b>113</b>
3.1. Agricultural censuses.....	114
3.2. National surveys.....	120
3.3. Local surveys.....	120
3.4. Household budget surveys.....	122
3.5. Official statistics, registers and administrative data.....	126
3.6. Qualitative data from focus groups and typical farm surveys.....	126
3.7. The global strategy minimum set of core data.....	127
<b>4. Proposal for an International Framework of Agricultural Typology.....</b>	<b>133</b>

4.1. Purpose and objective of an international framework of agricultural typology.....	133
4.2. Organization: layers and axes.....	134
<b>5. Next Steps and Gap Analysis: Overview of Methodological Challenges.....</b>	<b>154</b>
<b>References.....</b>	<b>157</b>
<b>Annex 1: IGU Typological Procedures.....</b>	<b>169</b>

# List of Figures

Figure 1. Selected criteria for identifying family farms and typology (IWG FF, 2014).....	71
Figure 2. WAW Theoretical assumptions about type transformations.....	106

# List of Tables

Table ES 1. Classificatory principles used for agricultural typological studies at the regional level.....	16
Table ES 2. Main classificatory principles used in global agricultural typologies..	18
Table ES 3. Main identifying criteria used in selected definitions of family farms.	20
Table ES 4. Overview of data required for building typologies.....	22
Table ES 5. Overview of data sources for establishing international types.....	28
Table ES 6. Potential sources of information for international types.....	32
Table 7. Identifying criteria used for agricultural typological studies at the regional level.....	73
Table 8. Comparing original and revised typology of the USDA Economic Research Survey.....	75
Table 9. WAW tentative international typology (under discussion).....	90
Table 10. Main identifying criteria used in global agricultural typology exercises.	99
Table 11. Main identifying criteria used in selected definitions of family farms....	102
Table 12. Overview of data for typology building.....	131
Table 13. Potential sources of information for international types.....	148

# List of Boxes

Box 1. Multivariate statistical analysis.....	47
Box 2. Working concepts for typology building.....	53
Box 3. Overview of WAW distinguishing criteria and thresholds.....	58
Box 4. WAW framework examples of external attributes related to policy priorities.....	59
Box 5. Farm household models and typologies at the national and sub-national Levels.....	63
Box 6. The Reunión especializada sobre agricultura familiar.....	77
Box 7. Inherent attributes to define the 1964 IGU international agricultural typology .....	94
Box 8. Examples of types developed in the 1964 IGU agricultural typology for the 1st, 2nd and 3rd orders.....	95
Box 9. The Agrimonde-Terra project.....	107
Box 10. Essential items recognized by FAO WCA 2020 (May 2015 draft).....	116
Box 11 AGRIS core and rotating modules.....	118
Box 12. RIGA variables.....	125
Box 13. Global Strategy MSCD.....	129
Box 14. International layer of the typology: classificatory principles, axes and data sources.....	144
Box 15. Livestock farm networks.....	149
Box 16. Classes of world ranges of identification variables and related\ Thresholds.....	169

# Acronyms and Abbreviations

AGRIS	Agricultural Integrated Survey
ARMS	Agricultural Resource Management Survey
CGIAR	Consultative Group for International Agricultural Research
CIRAD	<i>Centre de coopération internationale en recherche agronomique pour le développement</i>
EC	European Commission
EU	European Union
FADN	Farm Accountancy Data Network
GSARS	Global Strategy to Improve Agricultural and Rural Statistics
HLPE	FAO High-Level Panel of Experts on Food Security and Nutrition
IFAD	International Fund for Agricultural Development
IIASA	International Institute for Applied Systems Analysis
ISA	Integrated Survey of Agriculture
IYFF	International Year of Family Farming
LSMS	Living Standards Measurement Survey
MCA	Multiple Correspondence Analysis
Mercosur	<i>Mercado Común del Sur</i>
MFA	Multiple Factorial Analysis
MSCD	the Minimum Set of Core Data of the Global Strategy
OECD	Organization for Economic Co-operation and Development
OTEX	<i>Orientation technico-economique de l'exploitation</i>
PCA	Principal Components Analysis
REAF	<i>Reunión Especializada sobre Agricultura Familiar</i>
RIGA	Rural Income-Generating Activities
Rimisp	<i>Centro Latinoamericano para el Desarrollo Rural</i>
WAW	World Agriculture Watch
WCA	World Census of Agriculture

# Executive Summary

Many regions are experiencing profound agricultural and rural transformations and structural changes that are affecting the diversity of agricultural holdings and rural households (Deininger and Byerlee, 2011). In this context, attention must be paid to the most vulnerable groups because they possess fewer assets that can help them to mitigate risks and adopt adequate coping strategies. By building on the classical vision of agricultural transformation, which leads to concentration of agricultural holdings and the exit of most holders from the agricultural sector, policy often focuses on the types of holdings considered viable and classifies them in terms of their capacity to evolve into this model and eventually exit from agriculture through diversification or become a target for social-protection policies (Hazell and Rahman, 2014). The diversity of the paths actually followed and the complex social, environmental and economic challenges associated with past transformations show that policymakers should take more fully into account the diversity of agricultural holdings and the variety of possible transformations in terms of the assets held and the context in which they operate (Bosc *et al.*, 2012; Bourgeois *et al.*, 2012; Losch *et al.*, 2012; WAW, 2012; Dorin *et al.*, 2013; Davidova and Thomson, 2014).

In line with this rationale, the World Agriculture Watch (WAW) initiative supports its partners in documenting and building awareness of agricultural structural transformations and their effects on sustainable development, with a view to informing policy dialogue at the national and international levels. On this basis, WAW has started to develop an international framework to support the creation of comparable national classifications of holdings, which we refer to as “typologies”. This will help to capture more accurately the characteristics and transformations of different types of holdings and lead to more precise definitions and targeting of investments and policies. A grant from the International Fund for Agricultural Development (IFAD) supported testing on census and household datasets in France, Madagascar, Malawi, Nicaragua and Viet Nam, enriched with experiences from Argentina and Brazil. The project generated an international literature review, five national case studies, contributions from experts from Argentina and Brazil, several e-conferences and a synthesis report.<sup>1</sup>

---

<sup>1</sup> Available at:  
[http://www.worldagricultureswatch.org/sites/default/files/documents/synthesis\\_typology\\_report.pdf](http://www.worldagricultureswatch.org/sites/default/files/documents/synthesis_typology_report.pdf)

In this context, the FAO Committee on Agriculture has recommended the provision of further support in order to develop typologies of holdings and analyse their transformations. The outcome document of the International Year of Family Farming (IYFF) calls on FAO to “... continue the work initiated by the international working group on family farming (IWG-FF) to further develop key analysis and indicators to assist governments upon their requests to better understand the diversity of Family Farms and develop policies, accordingly.”

Given this recognition, the research programme of the Global Strategy to Improve Agricultural and Rural Statistics<sup>2</sup> made “Improving the methodology for data analysis – farm typology” one of its research priorities. The FAO Statistics Division and WAW are producing guidelines to support countries in the development of comparable typologies of agricultural holdings with a view to informing national and international policy dialogue and reinforcing related monitoring systems. The guidelines will offer an internationally comparable framework, harmonized methods and criteria to facilitate the definition of family farms and other statistical terms. They will be based on datasets such as censuses or household surveys, and will recommend improvements and collection of additional data when needed. The diversity of approaches will be illustrated by case studies.

This report contains a literature review of classifications and typologies developed in agriculture and a preliminary proposal for classification principles that can feed into the guidelines for establishing an international framework for farm typologies. The review will facilitate the development of an international framework for farm typologies that enables cross-border analyses of farm types with consideration of topics relevant to agricultural development.

## A. Main findings of the literature review

The topics covered in the literature review therefore cover three areas: i) the scientific development and building of typologies; ii) reviews of typological exercises at all levels in terms of their potential for analysis of agricultural transformations; and iii) an overview of international datasets that could support the construction of typologies at various scales.

---

<sup>2</sup> FAO and several partners developed the Global Strategy to Improve Agricultural and Rural Statistics with a view to improving agricultural statistics under the auspices of the United Nations Statistical Commission. See: <http://www.gsars.org>

## **Definition, construction approaches and challenges**

The literature reviewed here focuses initially on the definition and main steps in the building of typologies, together with their purposes and limitations. The term “classification” is often misused to mean “typology”, but in this context “classification” is to be understood as the analytical operation, and “classificatory schemes” and “typologies” as its products. The main differences between a typology and a classification scheme are: i) that in the latter only one classificatory principle is used, leading to two or more classes, whereas typologies take more than one classificatory principle into account, giving rise to mutually and jointly exclusive types; and ii) that types may be reduced or expanded for analytical purposes as details of classificatory principles are excluded or included.

The two basic construction approaches for building a typology are:

- Top-down – in which types are defined on the basis of assumptions or sources such as expert inputs, literature reviews, past trends, stakeholder interviews, field observations or policy guidance: this information is used to select classificatory principles. The approach may be developed with or without a posteriori validation from data or field-based feedback. This qualitative classification can also be validated, documented and subdivided on the basis of quantitative exercises in a combined approach to typology construction.
- Bottom up – on which the objects, events or data to be typified using statistical tools are grouped according to empirically derived criteria or quantitative methods. The goal is to obtain homogeneous groups with little variability among them; high variability among groups is enforced if the data of the objects or events to be typified are the main source of information. The main statistical tests quoted in the literature for typology building are principal and multivariate analysis and cluster analysis (Even *et al.*, 2014).

The number and nature of classificatory principles used to build a typology are usually guided by policy objectives and data availability. The latter makes it possible to use typologies in various ways to provide, for example, an overview of different players or detailed lists or maps as required. Typologies are hence products that make no assertions and so cannot be judged as “true” or “false”. They are, however, useful as mechanisms for organizing practical approaches and as exploratory tools.

An intrinsic challenge is the distinction between variables that can serve as classificatory principles and those that can be used to enrich the description of types and explain their trajectories or transformations. This is particularly the case when attempts are made to compare typological findings among regions or countries. The quest for comparability in agricultural typologies is not new: Kostrowicki (1989) documents work by geographers and agricultural economists in the 1930s, 1940s and 1950s to establish agricultural typologies. A significant lesson was the distinction between internal and external attributes: the latter relate to agro-ecological settings, policy and institutional environments and market conditions; the former refer to the intrinsic characteristics of agricultural holdings such as:

- social attributes – information about the holding operator or decision-maker in terms of gender, age and legal status;
- operational attributes – labour and capital inputs, the extent of farming intensification or diminution and the ways in which holdings are worked;
- production attributes – how much is produced and for what purpose; and
- structural attributes – the scale of land use, livestock breeding, gross agricultural output and commercial production.

The WAW *Methodological Framework* (Saravia Matus *et al.*, 2013a; Even and Saravia Matus, 2014) embraces the internal and external attributes developed by Kostrowicki (1964, 1984 and 1992) and recommended by Alvarez *et al.* (2014). The classificatory principles included in the WAW framework, for example, are labour usage, legal status and output orientation: these refer directly to the operational, social and production attributes mentioned above. With regard to external attributes, the indicators are used to address policy priorities in the WAW framework: a list of indicators was developed, for example, to describe livelihood outcomes related to sustainability – environmental, social and economic outcomes. The selection of indicators contributes to understanding the context in which farmers operate and the challenges they face.

A significant lesson arising from the revision of typology definitions and building processes is the importance of consistency in the use of working concepts: the terms “classification” and “typology” must be correctly used, and classificatory principles must be clearly distinguished from any description

variables that may be used. It is also essential to adopt a scientific approach to typology building to ensure replicability and comparability in different settings. If a combination of the top-down and bottom-up approaches is found to be suitable, the ways in which they are to be introduced must be accurately set out: a shared set of methods is crucial to ensure that typologies can be used as analytical tools that enhance comparability and help to organize practical approaches. In this respect it must be emphasized that typologies are not intended to substitute definitions or replace national categorizations, whereas farm typologies can enable comparisons in the agricultural sector and enrich international and regional policy dialogue.

### **Agricultural typologies at all levels: purpose and main features**

The report analyses agricultural typological exercises at the local, national, regional and global levels with a view to drawing lessons relevant to an integrated framework that makes it possible to connect typologies at different scales and that can be usefully applied at such scales. A major finding is that agricultural typologies are in demand as analytical tools that elucidate the diversity of agricultural holdings in a context of increasing demands on agriculture to address challenges ranging from food insecurity, food demand, climate change and environmental issues to poverty, employment and urban-rural inequalities, and to design more accurately targeted policies.

#### **National and local levels**

The literature review showed that national typologies are established to: i) feed into economic, social, environmental, technical and historical analyses at different geographical scales; ii) document the diversity of agricultural systems and their place in socio-economic and ecological environments to support the design of local, national and regional policies; and iii) identify the beneficiaries of targeted policies and public or private aid programmes (Saravia Matus *et al.*, 2013a). Countries may also develop generic typologies of homogeneous groups to: i) make comparisons over time and space with a view to monitoring transformations; ii) understand the distributional effects of policy, market and technological developments; and iii) develop farm samples for surveys. Typologies can hence support multi-purpose analyses: they may not be specific to a thematic question, but can be used to identify types with different levels of assets and strategies.

Local typologies may also be developed through econometric modelling. This requires the collection of extensive data to understand context-specific issues,

and the selection of identifying criteria is usually left to the discretion of users or expert consultation: they are hence context-specific and context-driven, which prevents them from being replicated accurately at higher levels of aggregation. They are nonetheless extremely useful in evaluating the effects of policy at the local level. The top-down or bottom-up approach is used to build most national-level and local-level typologies; they are not often combined, but the INOSYS partnership in France, which collects and analyses livestock data, and the typology guidelines produced by the Consultative Group on International Agricultural Research and Wageningen University are exceptions (Alvarez *et al.*, 2014).

The WAW literature review of national agricultural typologies (Saravia Matus *et al.*, 2013a) identified six classificatory principles used in typology building: labour usage, legal status, market orientation, diversification and specialization, land and business size, physical capital assets, and gender. Alvarez *et al.* (2014) argued that these principles serve to build: i) structural typologies based mainly on variables that describe resources and asset levels; and ii) functional typologies based on variables that describe livelihood strategies and household dynamics. The purpose of the typology drives the selection of the variables to identify types.

### **Regional level**

Few regional economic entities have official typologies of agricultural holdings. The best example of an official regional typology is that of the European Union (EU), which shows that a regional typology can achieve various objectives such as: i) facilitating analysis of the structural characteristics of agricultural holdings and their economic results, which is necessary in view of the diversity of regional production systems; ii) assembling homogeneous groups of holdings at various degrees of aggregation so that the situation of holdings can be compared; iii) serving as a basis for selecting samples for farm structure surveys and farms that are statistically representative of a farm typology; and iv) contributing to data analysis and dissemination throughout the EU. It is hence an important tool for providing data that are usable at different scales. A similar approach is the *Mercado Común del Sur* (Mercosur) space in the *Reunión Especializada sobre Agricultura Familiar* (REAF) forum for setting up a regional categorization of the family farming sector; it is, however, still at an early stage of development.

Table ES 1 shows that in non-official attempts to develop regional-level typologies the most common classificatory principles include information on

assets and economic size, context, labour usage, livelihood sources – understood as the percentage of income emerging from agricultural activities – and production systems.

**Table ES 1. Classificatory principles used for agricultural typological studies at the regional level**

Region	Identifying criteria				
	Assets and economic size	Context	Labour usage and status	% of agricultural income	Production system
EU typology	Economic size based on standard outputs			Importance of other gainful activities	Type of farming (OTEX)
<sup>3</sup> USDA typology*	Gross cash farm income		Family vs non-family farms, most businesses owned by operator*		
Latin America and the Caribbean typology**	Asset endowment: poor, limited or rich	Development: favourable/unfavourable			
Latin America and the Caribbean typology***			Family or non-family labour usage: 50% threshold	Level of agricultural income: 50% threshold	

\* United States Department of Agriculture; Family farms are further distinguished in terms of whether owners spend more than 50 percent of their work time on the farm.

\*\* Berdegue and Fuentealba (2011).

\*\*\* *Centro Latinoamericano para el Desarrollo Rural/IFAD* (2014).

Official and academic experiences with building regional typologies suggest that the development of regional classification systems could be continued by inviting countries to include certain criteria in their statistical systems, disseminate data in comparable tabulations and develop improved data-collection mechanisms.

### Global level

With regard to international agricultural typologies, most developers are international organizations or regional institutions, with some academic organizations. In all cases the aim is to produce global assessments of agricultural development and a framework for comparing national assessments.

---

<sup>3</sup> Included because USDA typological studies covered 51 states.

The various typological exercises reviewed are categorized on the basis of the unit of analysis used and their capacity to connect global, national and local contexts. Three main types emerge:

1. Global typologies based on farming or production systems. The agronomic criteria are used primarily to develop different types of farming or production systems; the exception is the *Institut Internationale des Sciences Administratives*/IFAD typology, which combines agronomic and economic criteria to classify farming systems. The bottom-up approach is preferred given the variety of information on agro-ecologies, production techniques and cropping systems.
2. Global typologies based on strategies, development pathways or rural settings. Here, hypotheses on development trajectories or contexts are used as the main units of analysis: the typologies are hence usually developed top-down and sometimes hermeneutically, but the findings are usually confirmed using the bottom-up approach.
3. Global typologies based on agricultural holding units, which may combine top-down and bottom-up approaches. They usually combine economic and social information, but the choice of classificatory principles varies.

**Table ES 2. Shows the main classification principles**

	Context			Production systems		Assets and management		Size and orientation					
	Agro-ecology	Socioeconomic context	Type of country – agriculture-based, transformed etc.	Location: urban/rural/coastal	Intensity of production	Type of farm production system	On-farm and off farm activity	Management	Labour usage	Farm assets	Income/poverty	Commercialization	Behaviour: producer/consumer
<b>Identifying criterion/event typified</b>													
<b>Farming systems</b>													
Dixon <i>et al.</i> (2001)	X			X	X	X				X		X	
Cassman <i>et al.</i> (2005)	X				X	X							
Hazell and Wood (2008)			X		X								
Seré and Steinfield (1996)	X				X	X				X			
IIASA* /IFAD (2014)	X					X						X	
Strategies, development pathways or rural settings													
World Bank (2007)							X						
OECD** (2006)										X	X	X	
HLPE*** (2013)		X								X			
Fan <i>et al.</i> (2013)	X	X	X							X			
Agricultural holdings/family farms													
Pingali and Rosegrant (1995)											X		
FAO (2014a)										X		X	
Brooks <i>et al.</i> (2008, 2011)										X		X	X
Saravia Matus <i>et al.</i> (2013a, 2014)					(X)	(X)	X	X				X	
CIRAD**** (2013)										X			
IGU***** (Kostrowicki, 1964)						X		X	X			X	

\* International Institute for Applied Systems Analysis

\*\* Organization for Economic Co-operation and Development.

\*\*\* FAO High-Level Panel of Experts on Food Security and Nutrition.

\*\*\*\* Centre de coopération internationale en recherche agronomique pour le développement.

\*\*\*\*\* International Geographical Union.

(X) implies that the related classification principle is proposed for use in the typology building process at a secondary level.

Source: adapted from IIASA/IFAD (2014).

The assessment of global agricultural typologies showed that the construction approaches and the methods used are rarely identified explicitly; in this review, the approaches were inferred. These elements are crucial because they ensure that the typologies can be replicated and used for analysis of transformations and monitoring. An important lesson learned with regard to maximizing international comparability is that a combined construction approach is adopted where top-down methods are used to select classificatory principles for defining international types, whereas bottom-up techniques are introduced to refine the types that may lead to the identification of national and local types. It must be emphasized that few frameworks aim to establish a continuum from the global to the national and local levels, which usually requires a connection between the unit of analysis and the holding level as in the WAW framework.

Another important aspect is that the unit to be typified is not always the agricultural holding: it may be farming systems, strategies or scenarios. Some assessments are limited to a sub-segment of a holding, notably household farms, smallholders or family farms. The diversity of units of analysis and the corresponding classificatory principles are shown in Table ES 2. Family farms and their identifying characteristics are not always included in the formulation of typological frameworks, so family farms are not disaggregated from other farms; in this respect the WAW and CIRAD frameworks are exceptions. In some contexts this is because the focus is not on the agricultural holding; in others the typology may focus on family farms because they cannot be evaluated against other forms of agricultural holding. The best option would be to integrate the definition of family farms into international frameworks of agricultural holdings: various definitions are documented in REAF-Mercosur (2010), IWG FF (2014) and FAO (2014) that provide insight into the consolidation of international agricultural frameworks at various scales. Table ES 3 sets out the main criteria used in the definition of family farms.

**Table ES 3. Main identifying criteria used in selected definitions of family farms**

Main identifying criteria	Definition			
	REAF	FAO-ESA	IWG-FF	IFAD/ Rimips
Family labour usage	X	X	X	X
Family head directly involved in farm work		X		
Agriculture is main source of family income		X		X
Family-level management	X	X	X	
Productive resources compatible with working capacity; usually limited	X	X		
Relationship with markets: autonomy or dependency			X	X

X denotes that the information source can identify the related international type.

Some definitions also reflect the fact that farming families may be involved in various activities other than production, but these are not usually proposed as distinguishing criteria.

When producing an international typology that is relevant to policy dialogue on family farming, it is useful to review the definitions applied at the regional and international levels and their classificatory principles, and when possible to use them in the identification of types and in related datasets. The WAW framework is open to criteria such as labour usage, legal status, management style and extent of commercialization for defining family farms. The WAW framework also uses the agricultural holding as the main unit of analysis in consolidating its international types. Two criteria frequently used to define family farms – usage of family labour and family-level management – are included in the WAW framework.

### Capturing agricultural transformations

This literature review indicates that typologies are likely to evolve from static analytical tools into dynamic tools that can capture the effects of agricultural transformations. Analysis of the various typological exercises indicates the usefulness of that using the agricultural holding as the main unit of observation or analysis rather than units of observation based on strategies or farming systems.

Typologies based on one-time measurements provide a snapshot of farm situations at a certain point in time (Kostrowicki, 1977) but they require regular updates to remain relevant: they should show, for example, how the types identified are maintained and how they change over time. Such studies do not

account for the possibility that the types themselves may have evolved into other types, or that new types may have emerged – but this does not prevent the studies from constituting a reliable starting point for analysis. To ensure that a dynamic typological study is replicable, the same group of variables should be used for tasks such as identification, description and monitoring of type trajectories/transformations.

Another example is a country-level typological exercise in Mali that aimed to introduce dynamic analysis and address some of the limitations referred to above. It is presented by Ouedraogo and Nayo (2013), who assess the stability of typology findings through analysis of Markov chains: for this, different “states” were defined in which populations of farms could be typified. Considering movements of individuals between states over time as a stochastic process, the probability that individuals would move between states was estimated. This made it possible to detect groups of stable types and their power to remain together as a group with reference to their transition probability. These movements were from one type to another, but not to new types. The methods and findings could be useful for country-level or local-level assessments, in which the types can also be identified or corroborated by experts.

The “agrarian diagnosis” method is another example of an approach that connects analyses of transformations and typologies in qualitative terms. The first step is to examine the main types of holdings in the past and analyse their trajectories of transformation; this is then used to establish a current typology of holdings and to provide hypotheses as to possible future trajectories.

At the local and national levels, typology findings can also be used to simulate farm trajectories from past to present or from present to future scenarios. For example, the WAW framework developed assumptions for the evolution of family farm types in terms of labour usage, access to markets and productive assets, which are often major markers of transformation. Forecasting at the global level, however, is a more complex task because more phenomena may alter the structure, performance and evolution of farms.

At the macro level, simulations are established to mark major development pathways or trajectories; region-specific or country-specific assumptions and scenarios may also be established to fine-tune the analysis. In other cases the transformations are captured at the level of the farming system to mark transitions from one system to another. In this respect techniques of consultation with stakeholders may feed into forecasting exercises as in the

*Agrimonde-Terra* project, which proposed a global framework for analysis of structural transformations in agriculture and suggested criteria such as use of labour, management, land use, purpose of production and off-farm activities. On the basis of such analysis and international multi-stakeholder dialogue, “typical types” are proposed that represent the possible future typology of holdings. The exercise is repeated at the national level, and the global framework is adapted to that context.

## International Data Frameworks

This review shows how the data sources (see Table ES 4) could contribute to the development of an international framework of agricultural typology, and indicates that various types of data may be used at different levels of analysis or for exploring the international, national or local scales of a typology, or even for building typologies focused on particular policy-related issues.

**Table ES 4. Overview of data required for building typologies**

Type of data	Scale	Data producer	International framework and dissemination	Frequency
1) Agricultural censuses	National, agricultural holding, comprehensive	National statistics institution or statistical unit of ministry of agriculture	FAO's World Programme for the Census of Agriculture (latest: WCA2020); dissemination of questionnaire and aggregated results; little open data	5 or 10 years
2) National surveys	National, sample, different scope	Usually government: ministries of agriculture, statistics and others	No, but attempts made in GSARS and AMIS projects as systems integrated with agricultural census	Variable, but more frequent than census
3) Local surveys	Local, not always representative	Various: research, projects, local institutions	No	Variable
4) Household budget survey such as LSMS*	National, household, sample	Government: ministries of statistics, economics, social affairs	LSMS provides framework with open dissemination of microdata	Usually annual
5) Registers and administrative data	Various, but often no specific sampling	Often government, but data gathered during administrative processes	Not at international level, but some regions provide frameworks: the REAF initiative propose framework for family registers	Variable
6) Geographical information, satellite information	Global and lower levels, but usually not on holding, only land use		FAO provides framework for classification of land use etc. and global system of dissemination	
7) Qualitative data from focus groups or field data	Various, no representative	Various, may include farmer, research	No	

\* Living standard measurement survey.

The main advantage of agricultural censuses is that they are conducted in many countries and could become a source of reliable and comparable data on which to base an international framework of agricultural typology. Countries do not always follow FAO guidelines, however, and censuses are not always comparable. The typologies emerging from agricultural censuses suffer from the shortcoming of being updated only once every decade – but if frequent surveys are associated with agricultural censuses, they may serve to monitor changes in representative samples and thus inform policy objectives. One such attempt relates to the Integrated Agricultural Survey (AGRIS) project of the GSARS, which is designed as a cost-effective way for national statistics agencies in developing countries to accelerate the production of quality disaggregated data on the technical, economic, environmental and social dimensions of agricultural holdings.

National surveys have been used as complementary instruments in updating agricultural datasets in the official typologies of high-income countries. They have the advantages of being updated annually or bi-annually and they comprise a variety of data. To minimize costs they are conducted only on a sample of holdings representative of the national distribution of holdings. They are often connected to an official classification of holdings: farms sampled for the Farm Accountancy Data Network, for example, must be representative of the common EU typology.

Local surveys are used to some extent to corroborate the information in agricultural censuses, providing information about research or development projects. In general such ad hoc surveys are interesting in that they can address a variety of issues, but they cover only a small sample of agricultural holdings and are highly context-specific; in such cases local surveys can be used for in-depth analyses.

Household budget surveys are often organized in accordance with the World Bank LSMS, which ensures the open dissemination of data and relative comparability and is hence another source for cross-border analyses of households, linking agriculture and poverty-reduction issues. Depending on their coverage these surveys can provide local-level or national-level information. Official statistics or registers, administrative data and multi-sector official statistics can also be used to complement national-level or local-level typological assessments, and qualitative data from focus groups or field observations can be adjusted to contribute to local-level typologies. Geographic information does not provide details of holdings, but it can provide information on the context of holdings and aggregated estimates of land use and production

levels; it can also be combined with holding and household data to support deeper analysis.

Improved harmonization and compatibility of data are important for international policy dialogue, but they can generate difficulties at the national level. National statistics systems must hence be improved and extended to use more data-collection and processing techniques; in this context globalized data harmonization initiatives that can support the development of an international typology linked to national and local realities are major assets. Initiatives such as AGRIS and the minimum set of core data developed by the Global Strategy are crucial in advancing international policy dialogue based on comparable typological findings. The essential items published in 2015 of the 2020 World Programme for the Census of Agriculture are important starting points in building international typologies of agricultural holdings.

## **B. Proposal for an international framework for agricultural typology**

This literature review supports the proposal for an international framework of agricultural typology based on the establishment of layers and axes, a combined construction approach and feedback systems, which help to refine the identification of types and their characteristics. The proposal focuses on the agricultural holding or micro level to develop the classification system; it is based on classificatory principles for the international layer, and can be adapted to national and local contexts. Each of the proposed thematic axes is hence correlated with identifying and descriptive indicators, and is aligned to policy interests.

### **Gap analysis and the purpose of an international framework for a typology of agricultural holdings**

The literature review demonstrates the interest in and need for typology-based tools for the analysis of topics relevant to agricultural-sector policy. The typologies were developed largely with a view to capturing the diversity of agricultural agents and facilitating understanding of their evolution or transformation.

The typological exercises reviewed were diverse, and few attempts were made to understand the main characteristics of agricultural holdings as opposed to farming systems, strategies, development pathways or rural settings. In the frameworks that actually focus on agricultural holdings, the emphasis is on

market orientation, management style, size and assets, and, to a lesser degree, production systems. The agronomic and socio-economic contexts were rarely included when the agricultural holding unit was the basis of the typology,<sup>4</sup> which shows that the inclusion of various topics in a single typology framework poses significant challenges.

Another gap in international typologies based on agricultural holdings is that they are either based on family farms only, or do not explore the distinctive qualities of the family sector. The WAW framework is an exception in that it analyses family farms together with family businesses, also known as “patronal farms”, and corporate farming. There is a need for an international framework to typify agricultural holdings that: i) does not identify family farms with other forms of farming; ii) considers other agricultural agents such as landless workers and herders; and iii) takes into account information about the structure, orientation, production system, economic size and territorial components of family farms. There is, in other words, a policy interest in the identification and description of types at the international, national and local scales using various axes of analysis: such a framework must be versatile so that international, national and local types can be developed with policy-relevant topics taken into account as required.

A flexible system is necessary to enable that policymakers to use the findings of a cross-border comparable agricultural typology with global, national and local focus areas. Each user will have different interests in terms of the scale of analysis and policy topics: researchers in international organizations may focus on international types that reflect the effects of global challenges, and others may need to analyse the effects of particular policies and contexts such as climate-resistant conditions for crop-specific farms.

An international framework of agricultural typology could also contribute to the monitoring of agricultural transformations at various scales of analysis, and could hence support evaluations of the effects of policies in related areas of development and foster evolutionary comparisons and international policy dialogue on possible intervention or assistance programmes in the sector.

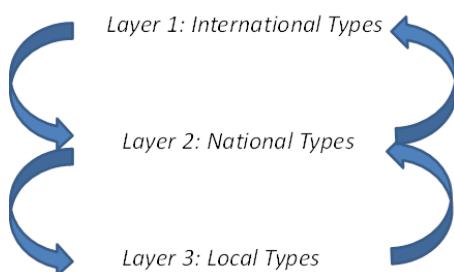
---

<sup>4</sup> IFAD's IIASA framework (IFAD, 2014) is an exception, but it focuses on farming systems and not agricultural holdings. In Fan *et al.* (2013), who incorporate information on the socioeconomic context, the unit of analysis is behavioural strategies.

## **Organization of the international framework for agricultural typology into layers and axes**

A major finding of the literature review is that a combined construction approach is likely to be the best option for establishing an agricultural typology that connects the global, national and local levels. The agricultural holding – including the various forms of farm household and rural agents – should be the main unit of analysis and observation in developing the typology.

The connections between the global, national and local contexts are achieved by means of connecting layers:



The idea is that local types evolve from national types, and national types are defined on the basis of the primary structure of international types, which require advance selection of classificatory principles. The connection should flow from the macro scale to the micro scale, and also establish feedback mechanisms from the local to the national and international layers. The higher layers of types will be driven largely by a top-down approach, whereas the lower levels – which incorporate types with additional details – will be mainly derived from statistical or bottom-up procedures.

The international framework also considers a set of axes related to policy-relevant aspects of agricultural development.

### **Axis 1: Structure and market orientation**

This axis focuses on the structure of agricultural holdings: the concepts of family, family business and corporate farms are covered along with classificatory principles related to labour usage, legal status and management; market orientation – commercial or subsistence production – is also considered. The axis incorporates information about off-farm income-generating activities at the agricultural holding level and the extent to which agriculture is the main livelihood of the farm-household. Taken together, off-farm and market

orientation can indicate links with agricultural activity in general and with non-agricultural activities: the approach can distinguish vulnerable semi-subsistence and subsistence farms from those deriving additional income from other sources.

### **Axis 2: Production system and economic size**

This axis is built on indicators using a similar variable, which allocates standard economic values to crops and livestock on the basis of land use, livestock management systems and local standard values of yields and prices. Such methods are used notably in the EU and the United States, but other countries have shown interest. This axis is related to types of production system and degrees of specialization at the agricultural holding level, whereas the economic size component of the axis is intended to establish comparisons among farms involved in different agricultural activities.

### **Axis 3: Territorial – agro-ecological and social setting**

This axis, which captures the agro-ecological and socio-economic context of agricultural holdings, can provide information on agronomic context or if necessary explore poverty, inequality and food-security issues.

The layers and axes are related to a set of classificatory principles and descriptive variables that enable identification and description of types at the various scales of analysis. To address policy needs, the first axis can be independently combined with the other two in order with a view to exploring sector-specific questions or address territory-specific challenges.

### **International types**

Table ES 5 shows the data sources used to establish international types – layer 1 – with the various axes of analysis.

**Table ES 5. Overview of data sources for establishing international types**

Axes of analysis	Data source	Variable/threshold
<b>Structure and orientation axis</b>		
Labour use – working time on holding by family and employees	WCA 2020 items 902 and 903	Over 50% family labour on family farms; less than 50% family labour on family business farms; 100% hired labour on corporate farms
Management style/legal status	WCA 2020 item 103	Household or non-household
Market orientation – purpose of production	WCA 2020 item 107	Commercial or own consumption
Off-farm activity – is agriculture the main activity?	WCA 2020 item 901	Agriculture is/is not the main activity
Production system and economic axis	WCA 2020 item 202 – area by land use; item 501 – no. of animals; 1201 – presence of aquaculture	Main production system – crops, livestock, mixed, aquaculture)
Territorial axis		
Agro-ecological	Global agro-ecological zones (FAO-IIASA)	Tropical, sub-tropical, temperate
Socio-economic	WCA 2020 item 101 – location; FAO hunger map; Fan <i>et al.</i> (2013) country classification	Agriculture-based, transforming or transformed country

Starting with Axis 1 and considering a broad set of agents or units of analysis to be typified, the following international types can be identified:

- I. landless agricultural workers;
- II. semi-subsistence family farm with main income outside farming;<sup>5</sup>
- III. semi-subsistence family farm with main income in farming;
- IV. family farm with market orientation;
- V. semi-subsistence family business farm with main income outside farming;
- VI. family business farm with market orientation and main income in farming; or whether a family member or external individual is in charge of management;
- VII. family business farm with market orientation and main income outside farming, usually with a hired manager and little family labour; and
- VIII. corporate farm.

For the production system and economic size axis a simple international classification could be established for cropping, livestock raising or mixed production to refine the identification of family, family business and corporate

---

<sup>5</sup> In WAW (2014) this type is further divided between marginal and multi-purpose farms depending on differences in terms of assets and the viability of on-farm and off-farm activities.

farms. If crop-specific assessments are undertaken, it should also be possible to adjust types in order to examine the composition of farms in particular sub-sectors – family, family business and corporate farms cultivating coffee, for example. Information about economic size would be excluded at the international level, but explored in the national layers by adapting measurements to the data available.

With regard to international types, the territorial axis could be introduced by reviewing the classifications in the FAO-IISA global agro-ecological zones. A condensed version could include tropical, sub-tropical and temperate zones and could hence indicate the global number of family farms in particular agro-ecologies. In terms of the socio-economic component of the territorial axis, regions or countries could be distinguished on the basis of dependence on agriculture, access to markets and overall welfare, as suggested by Fan *et al.* (2013), Berdegué *et al.* (2011) and OECD (2009). The territorial axis could build on item 101: Identification and location of agricultural holding of the WCA 2020 programme: this would provide the locations of holdings, which could be combined with information from administrative maps relating to food security and poverty.

The international types can, in short, be combined with production systems or territorial axes to provide a wider view of the situation of agricultural holdings. Other variables not used for identification purposes can therefore be used to describe types.

### National types

There are various ways to define the second layer of the international typology, which relates to the national types that evolve from the international types. The establishment of national and local types is based on the classificatory principles established in the international layer, but the thresholds may be subdivided to identify new types. Alternatively, new classificatory principles may be introduced that are based on the policy interests and the available data. In the case of the structure and orientation axis, the first option can be achieved by altering the established thresholds from 50 percent to give two classes, or from 0 percent to 10 percent, 20 percent or 30 percent to give more classes. With regard to off-farm activities, holdings can be classified according to their main source of income other than agriculture. For the second option, an additional classificatory principle aligned with the structure and orientation axis could be the introduction of asset-based information at the agricultural holding level.

Another option is to expand national typologies by introducing identification variables associated with production systems – crop mixes, combined livestock/cropping systems, forestry and aquaculture – and economic size. Information about economic size would augment information about size based on land surface, which does not take into account different types of production – 1 ha of cereals is very different from 1 ha of vineyard, for example – and cannot incorporate levels of animal production. To achieve this a national coefficient would have to be created to convert and compare different types of production and determine thresholds in different categories; an example is the measurement of standard outputs in the EU typology. Alternative methods to identify and categorize types of agricultural holdings on the basis of their economic size can be considered: in Brazil, for example, the estimated economic production level was divided by assumed opportunity costs of labour to determine relative income, which varied from half the agricultural wage to three times the wage (Guanziroli, 2013). Countries could also develop proxies to refine the structural classification of farm types: this would involve combining criteria related to assets and mechanization, for example, with national thresholds such as irrigated areas and numbers of particular livestock. This approach was used in Argentina at the regional level to indicate the economic size of agricultural holdings (Scheinkeman de Obschatko, 2009). The current FAO initiative on developing internationally harmonized rural livelihood indicators could also augment information on the actual income levels of different agricultural agents, which would facilitate further classification and enhance comparability (FAO, 2014b).

The territorial axis could also be extended to the consolidation of national types. This could be achieved by introducing an updated overview of agricultural zoning, poverty and food security. Areas vulnerable to climate change could also be identified and introduced into the analysis. The use of national-level administrative units could also be useful in that they can reflect political and organizational aspects at the territorial level.

### **Local types**

At this level detailed information about livelihood strategies, assets, production systems, economic size, agro-ecological zones and socio-economic constraints leading to numerous classes and types could be introduced, provided that coherence with previous typology layers is maintained. The characteristics emerging from the structure and orientation axis, the production system and economic size axis and the territorial axis can be combined to address local requirements. Cross-border analysis and comparisons of emerging sub-national

or local types may consequently be reduced, because territorial aspects, particular mixes of production systems and approaches to measuring economic size may not be directly comparable. The nature of assets included to identify local types may also be context-specific.

Local types, which can be specific to national regions, could be further assessed under farm-household models to feed into local planning. At this level it is also possible to support new sampling and data-collection approaches. An important aspect is that as more characteristics are included to identify types, descriptive variables related to territory may become identifying dimensions, leaving less room for significant descriptive assessments.

### **Units of analysis, data sources and an international framework of monitoring systems**

The proposed international framework of agricultural typology embraces the FAO definition of the farm-household, in which landless people, nomadic herders and farm households that do not have agriculture as their main livelihood are typified along with family, family business and corporate farms. This concept of the unit of analysis, which considers agricultural holdings and also the diversity of rural agents, addresses the objectives of understanding the different forms of farming and participation in the agricultural sector, and of capturing rural transformation trends.

Table ES 6 shows information sources for some of the international types that have a broad definition of the unit of analysis. Landless agricultural workers with no evident source of income, for example, may be captured more accurately in population or household surveys rather than agricultural censuses. Semi-subsistence family farmers whose main source of income is not agriculture may also be captured in such surveys, unless the thresholds of the national agricultural census are particularly inclusive. Clearly, semi-subsistence family farmers who depend mainly on agriculture and market-oriented family farmers are likely to be captured in agricultural and population censuses; the same applies to semi-subsistence family business farms even if the main source of income is outside farming. Information about market-oriented family business farms, whether or not farming is the main source of income may be found in agricultural and population datasets and in business surveys or national registries. Data related to corporate farms may be found in agricultural census and business surveys, tax records and registries.

**Table ES 6. Potential sources of information for international types**

	<b>International types based on wide definition of the unit of analysis</b>	<b>Agricultural census</b>	<b>Population or household surveys</b>	<b>Business survey/tax or national registry records</b>
1	1. Landless agricultural workers		X	
2	2. Semi-subsistence family farm with main income outside agriculture	X	X	
3	3. Semi-subsistence family farm with main income in agriculture	(X) sometimes excluded if a size threshold is imposed	X	
4	4. Market-oriented family farm	X	X	
5	5. Semi-subsistence family business farm with main income outside farming	X	X	
6	6. Market-oriented family business farm with main income in farming	X	(X) sometimes excluded when separate legal business	(X) depends on registration and national system
7	7. Market-oriented family business farm with main income outside farming, possibly managed by the family but with little family labour	X	(X) sometimes excluded when separate legal business	(X) depends on registration and national system
8	8. Corporate farm	(X) but sometimes sampling problems		X

X denotes that the information source can identify the related international type.

(X) denotes exceptions to such data collection/participation processes.

Another consideration with regard to data sources and the unit of analysis relates to the generation and adaptation of monitoring systems aligned with the international framework of agricultural typology.

Most of the literature on assessing agricultural transformations enquires initially into current trends driving rural transformations (Saravia Matus *et al.*, 2013b; Losch *et al.*, 2012). These include vertical/horizontal integration, externalization, diversification and atomization. There is, however, a gap in terms of connecting the effects of these trends at the local level of agricultural holdings: specific variables have to be established and monitored to show how agricultural transformations are determining who produces and what is

produced, for what purpose and with what resources. Further analysis is needed to assess the socio-economic, environmental and political consequences of transformations in the agricultural and other sectors.

There is a variety of potential mechanisms related to the assessment of transformations at the global, national and local levels, but no single framework that integrates these levels in terms of the various rural agents. Different monitoring approaches have been developed in the context of national resources and data availability: examples include: i) statistical observations that rely on quantitative data from censuses or surveys; ii) observations that gather and organize administrative data from systems of accountancy, quality control or taxation; and iii) observations that use “representative” or typical farms; and iv) observations based on farm registration. These usually rely on expert meetings or local-level modelling to capture farm-level changes and are dependent on the context in which they operate. They have in common, however, the fact that they are usually associated with typologies to define the object of monitoring and capture its transformations.

An interesting case study combining different forms of data source is the French livestock farm network, which provides lessons for building an international framework of agricultural monitoring. In the cases where countries have limited resources, the development of typologies at the national and local levels can help with the identification of farms for close monitoring. In developed countries, monitoring is often accompanied by extension services and technical support; indeed, this is a major objective of the French Livestock Institute, which also studies local reports at the national level to identify trends relevant for policy-makers at the upper scales of analysis.

This approach makes it possible to document local data-collection and analysis approaches for replication elsewhere. Local monitoring systems could eventually foster national systems that feed into the international level. There are still methodological challenges with regard to adapting typologies as structural changes become entrenched, but the typology-based tool is a significant starting point for analysis. Synergistic approaches such as *Agrimonde-Terra* could be explored to include statistics-based information and stakeholder analysis to enrich the assessment of transformations.

## **Adaptation of the international framework: basic steps**

The basic steps for adapting the international framework of agricultural typology are:

- I. initial analysis to determine the nature of the typological work, assess data sources and explore related literature to provide an overview of agricultural transformations and trajectories of the main typologies of holdings; stakeholders may also be contacted at this stage;
- II. selection and organization of data related to the classificatory principles required in the international layer of the typology; at this stage the classificatory principles and their thresholds are usually already determined to improve comparability;
- III. development of a database for the consolidation of national types; additional information can be drawn from country-level typological studies, transformation assessments, field work and stakeholder consultations, and if possible other sources such as population surveys or business surveys; methodological support for data collection and handling would be required;
- IV. identification and description of national and local types, introducing the combined construction approach involving statistical analysis to identify and describe types;
- V. integration of statistical information with administrative sources and interviews, and further data-collection to improve types at every layer; training in the development of samples and surveys could be useful;
- VI. analysis of typology findings to inform policy, with stakeholder involvement to provide feedback across layers; guidelines on the involvement of different stakeholders would be welcome, and policy assessments, simulation tools at the farm level and predictive methods can be explored to enhance the analysis and use of the typology; and
- VII. dissemination of data and findings to support and inform monitoring systems; guidelines on the development of monitoring systems may also be needed.

## **Gap analysis and next steps**

Addressing the methodological gaps in the development of guidelines supporting the proposed international framework of agricultural typology call for statistical expertise and stakeholder involvement. The areas requiring further support are described below.

It is essential to exploit expert knowledge to optimize data handling at the country level and to establish methods for incorporating information from national-level sources such as complementary surveys, interviews, focus groups and agrarian diagnosis.

Methodological guidelines are required to support the combined construction approach. Practitioners developing an international typology connected with a national and local context require in-depth knowledge of methods that are compatible with the available data: this will involve an overview of methods by type of approach, the question of subjectivity and objectivity in choosing methods, consideration of the effects on typology outcomes and an assessment of the advantages and disadvantages of each method in terms of data constraints. A glossary of statistical terms should be made available to support quantitative exercises to identify or describe farm types and data collection and handling.

A list of indicators for the initial layers of the international framework should be established to address the gap in analytical tools that can be used for the description of types from multivariate analyses to farm models, particularly in the layers that cover sub-national and local types; regression analysis may also be used to identify and describe types. The guidelines must be based on best practices in the implementation of statistical and deductive methods. In Even *et al.* (2014), analysis-of-variance and Duncan multiple-range tests were used to describe types, but any descriptive tool should be assessed to determine its suitability for policy formulation, evaluation or monitoring. Descriptive analyses could be developed on the basis of a template that presents results as thoroughly as possible, but this must be addressed in the light of relevance to national policies. Case studies could be used to identify ways in which type descriptions could be used in policy evaluation and monitoring.

There are challenges in establishing long-term monitoring systems, particularly when statistical systems are unsuitable for dynamic analysis. The literature indicates that these challenges could be overcome as new programmes such as AGRIS are implemented to support countries developing integrated survey and

census systems. Collecting data on the micro-economics of farms, however, and understanding the way they function with a view to building farm models for ex-ante or ex-post analysis calls for detailed data and well-developed micro-econometric and modelling skills. Many farms, particularly small and semi-subsistence farms, do not keep records of their operations, which limits the amount of reliable information available. The guidelines should therefore offer monitoring systems based on in-depth surveys of samples drawn from national and sub-national classifications carried out by extension or advisory services.

With regard to classification and typology, an approach that captures agricultural transformations on the basis of typological findings is required, whether changes are captured at the agricultural holding or type level or whether these trajectories are hypothesized from a macro perspective, along with further methodological development to find ways of integrating it into the framework.

Support for national approaches to analysis of disaggregated types according to territory, which may be defined according to agro-ecological or other characteristics, requires consideration of methods for identifying and building such territories and accounting for them in analysis: criteria for selecting and characterizing territories with different transformation patterns are therefore needed. Mapping tools may be useful to show differences among and within territories; this is a particular challenge because the “local” scale can vary according to country size.

In view of the importance of the effects that this work can have on policy, processes for stakeholder involvement should be included because their inputs can influence type formation. Stakeholder involvement may vary according to the level at which the work is carried out, so decentralized and local-level systems of stakeholder involvement will be required.

# Introduction

## Global context and rationale for the development of guidelines

Many regions of the world are experiencing fundamental agricultural and rural transformations, or structural changes, that affect the diversity of agricultural holdings and rural households (Deininger and Byerlee, 2011). In this context, the most vulnerable groups are likely to be affected more than others because they have fewer assets to enable them to face risks and adopt coping strategies. Because policy tends to be based on the classical view of agricultural transformations leading to consolidation among agricultural holdings and the exit of most holders from the sector, it focuses on the types of holdings considered viable and classifies them in terms of the likelihood of evolving into this model, leaving the sector by diversifying or becoming a target for social-protection policies (Hazell and Rahman 2014). The diversity of paths actually followed and the social, environmental and economic challenges associated with past transformations show that policy-makers must take more fully into account the diversity of agricultural holdings and evolutions related to their assets and the contexts in which they operate (Bosc *et al.*, 2012; Bourgeois *et al.*, 2012; Losch *et al.*, 2012; WAW, 2012; Dorin *et al.*, 2013; Davidova and Thomson, 2014).

The reports of the IYFF accordingly emphasized the need to enhance understanding of the characteristics and diversity of family farming in the context of agricultural transformation (FAO, 2014). It was pointed out that policy-making with regard to family farming was hindered by lack of definition and characterization at the national and regional levels and limited statistical data at the holding level, with the result that family farms were identified in terms of land size, as in many agricultural censuses. This focus on size alone is now regarded as insufficient for accurate identification of vulnerable family farms.

In view of the urgent need to address the question of the definition of family farms and typologies at the national and regional levels and its importance for IYFF outputs after 2014, FAO set up the IWG-FF. The group built on work by the IYFF and WAW on typologies for agricultural holdings and initiatives such as the regional criteria and national registers of family farms published by the special meeting of the *Mercado Común del Sur* (Mercosur) on family farming.

The FAO committee on agriculture recommended further support for the development of typologies of holdings and analysis of their transformations, and the outcome document of the IYFF called on its members to: "... continue the work initiated by the IWG-FF to further develop key analysis and indicators to assist governments upon their requests to better understand the diversity of Family Farms and develop policies, accordingly ...". Several countries have already requested assistance with the development of typologies.

### **WAW work, past and ongoing**

In line with this rationale, WAW was set up with a secretariat in FAO and initial support from the International Fund for Agricultural Development (IFAD), the *Centre de coopération internationale en recherche agronomique pour le développement* (CIRAD) and France. The aim of WAW is to support its partners in building awareness about agricultural structural transformations and their effects on sustainable development with a view to informing national and international policy dialogue. It is accordingly supporting countries building classifications of holdings, or "typologies", and developing a tool to capture transformations in different types of holdings with a view to informing investments and policies. With funding from an IFAD grant, this tool was tested on census and household datasets in France, Madagascar, Malawi, Nicaragua and Viet Nam. Outcomes included a literature review, five national case studies, expert contributions from Argentina and Brazil, e-conferences and a synthesis report;<sup>6</sup> these will be building blocks for the guidelines.

A second IFAD grant is: i) enabling WAW to consolidate and increase its observation centres to identify, monitor and report on rural transformations with a view to informing national policy dialogue (see Annex 1); and ii) providing Madagascar, Vietnam and two new countries with seed funds to enhance their monitoring capacities and extend their knowledge of rural transformations and typologies.

### **Developing the guidelines**

Given the interest in obtaining FAO guidelines for the development of typologies for identifying and understanding different agricultural holdings and

---

<sup>6</sup> See:

[http://www.worldagricultureswatch.org/sites/default/files/documents/synthesis\\_typology\\_report.pdf](http://www.worldagricultureswatch.org/sites/default/files/documents/synthesis_typology_report.pdf)

designing relevant policies, the Global Strategy to Improve Agricultural and Rural Statistics (GSARS)<sup>7</sup> made the topic “Improving the methodology for data analysis – Farm typology” a research priority. Typologies can be an effective tool for: i) fostering policy analysis with farm-level indicators; ii) developing systems for monitoring structural changes; and iii) facilitating comparisons to enhance policy dialogue at the national, regional and international levels. This also reflects the “... vacuum of theoretical and empirical studies which examine the diversity of agricultural holdings in a continuum, providing at the same time internationally comparable working concepts and indicators that are meaningful under different socio-economic and agricultural settings. Essentially, there is no framework for analysing agricultural holdings in the same level or set of dimensions or for monitoring their structural transformations at the local, national, regional and global levels. Overall, the lack of such mechanism is an enormous handicap in terms of providing national policy makers a comparative or relative vision of local and national agricultural contexts while also serving as evidence-based resources to inform policy dialogue at an international scale ...” (Saravia Matus *et al.*, 2013a).

The development of guidelines for typology building can address this gap by proposing an international framework that identifies particular types of agricultural holding on the basis of certain statistical variables and establishes a core dataset that can be completed by adding variables to guide countries in adapting the framework to their own contexts. The variables must cover aspects of family farms other than size to achieve an accurate representation of the social relationships involved in family farming. In any case, comparisons based on size alone are inadequate for establishing accurate comparisons of different types of agricultural holding.

The approach includes:

- a literature review;
- an outline for the guidelines and the associated toolkit;
- establishment of an expert group to review the initial outputs and develop the guidelines;
- empirical studies with country partners to identify interest in the handbook and plans for technical assistance and implementation;

---

<sup>7</sup> GSARS ([www.gsars.org](http://www.gsars.org)) was developed by FAO and various partners under the auspices of the United Nations Statistical Commission with a view to improving agricultural statistics.

- a first draft of the guidelines on typologies, handling data on agricultural holdings and field work;
- an international meeting to peer review the draft guidelines;
- field testing;
- production of the final guidelines and country case studies; and
- a second international meeting to peer review the final guidelines and case studies.

The initial draft should be available by the end of 2016 and field testing will take place in El Salvador, Madagascar, Niger, Senegal, Tunisia and Viet Nam. The final draft is expected by the end of 2017; after peer review it will be published by GSARS. The contributing experts and institutions will constitute a pool of expertise for scaling up the work.

## **Objective and scope of the literature review**

The WAW literature review of 180 typological studies in 70 countries and regions worldwide, the final report on case studies in seven countries, the IWG and IYFF reports on family farm classification, and regional and international typologies from FAO, the Consultative Group for International Agricultural Research (CGIAR), CIRAD, the European Commission, the *Centro Latinoamericano para el Desarrollo Rural* (Rimisp) and the International Institute for Applied Systems Analysis (IIASA) are all considered with a view to enhancing understanding the purpose and use of typology frameworks at the national, regional and international levels. This review also assesses selection procedures, combinations of identifying criteria and construction and development approaches. The reviewed experiences with typologies and related building processes will contribute to the development of a common working vocabulary that will enhance comparability among types and facilitate the establishment of typologies at all levels.

The identifying criteria and construction approaches emerging from this analysis are augmented with consideration of international data frameworks such as the World Census of Agriculture (WCA), the Minimum Set of Core Data (MSCD) of the Global Strategy, the LSMS Integrated Survey of Agriculture (ISA), and AGRIS: these can also guide the selection and definition of variables by national data-collection systems and help to detect gaps in national statistical systems.

This literature review also addresses the following issues:

1. What is a typology? Many typological exercises fail to show how types are consolidated by highlighting the main classificatory principles or identifying criteria for building types. Terminology is often misleading and sometimes confuses terms such as “category”, “class” and “type”, and the selection of construction approaches and implementation methods is not always explained. This section clarifies such issues, proposes a science-based approach to typology development and points out the limitations of the typology as an analytical tool.
2. Overviews of agricultural typology exercises, identification variables and construction approaches and analysis of agricultural transformations build on previous literature reviews of the topic to identify findings and lessons relevant to creating a framework of agricultural typology that connects the global and local contexts. Local, national, regional and international typologies are considered separately, and existing definitions of family farming are examined with a view to identifying common classificatory principles. The section also considers the capturing and monitoring agricultural transformations and the extent to which typology-based tools are used for that purpose.
3. With regard to data sources, this section examines a range of international data frameworks and considers the extent to which different global initiatives collect similar variables that can be used in building internationally comparable types of agricultural holdings. This overview provides a context in which classificatory principles can be selected for the identification of international and national types along with descriptive criteria and transformation processes; the ways in which data sources have been used to support typology building processes are also discussed.
4. On the basis of insights drawn from the literature review, this section proposes a draft international framework of agricultural typology that connects global, national and local types and provides for international comparability and detailed development of types at the national and local levels. It suggests an approach based on matrixes with three axes of information: i) structure and orientation; ii) production system and economic size; and iii) territorial components such as agro-ecology and socio-economic settings. A draft for an accompanying monitoring system is also provided.
5. The section on gap analysis and next steps explores issues to be resolved to create a functional agricultural typological framework

linking the international, national and local contexts. This includes the drafting of guidelines for developing the international framework for agricultural typology and consideration of methodological matters such as: i) assessing the statistical tools and software required to improve the identification and description of national types and sub-types, and analysis of transformation monitoring approaches; ii) reviewing methodological challenges in the collection, handling and integration of data, with examples drawn from case studies that illustrate the use of a combined top-down and bottom-up construction approach. The importance of involving national and local stakeholders in the development of the typology and in monitoring the transformations is emphasized.

# What is a Typology?

## 1.1. Definition of “typology” and “type”

Many researchers and international organizations have recommended the use of classification schemes and typologies to capture the diversity of farms: Emtage *et al.* (2006), Kostrowicki (1977, 1970, 1968, 1964), Busck (2002), Whatmore (1994), Landais (1998), Howden *et al.* (1998), Howden and Vanclay (2000), Kobrich *et al.* (2003), Saravia Matus *et al.* (2013a), IIASA/IFAD (2014), Rimisp /IFAD (2014), Dixon *et al.* (2001) and Alvarez *et al.* (2014). But they differ considerably when it comes to the actual processes of defining and developing typologies and the definitions of terms such as “classification”, “typology” and “taxonomy”. This discussion seeks: i) to clarify the definition of a typology, and offer a working vocabulary of common concepts and terms; ii) to consider the advantages and limitations of typology tools in policy analysis; and iii) give a basic description of typology construction approaches and their main methods.

The term “classification” is often misused as synonym for typology, but as argued by Marradi (1990) classification should be understood as the operation<sup>8</sup> itself, whereas classificatory schemes and typologies are products of the operation. Another major difference between a typology and a classification scheme lies in the concept of the “basis of division”. A classificatory scheme has a single basis of division that gives rise to  $x$  number of classes.<sup>9</sup> In a typology, several classificatory principles are taken into account simultaneously<sup>10</sup> to give rise to an  $n$ -dimensional set of types where  $n$  is the

---

<sup>8</sup> Classification can be defined as an operation whereby the extension of a concept at a given level of generality is subdivided into two or more extensions corresponding to the number of concepts at a lower level of generality. The subdivision is obtained by stating that an aspect of the intension of each of the latter is a different partial articulation of the corresponding aspect of the intension of the higher concept. In principle all other aspects of the intension of the higher concept are carried into each of the lower concepts: if we classify dogs by colour, for example, the class of black dogs is characterized by all properties of “dogness”, except those incompatible with “blackness” (Marradi, 1990).

<sup>9</sup> A simple example given by Marradi (1990) is the levels of the educational system: primary, secondary and tertiary.

<sup>10</sup> Examples of typologies are found in various scientific realms. In socio-political studies, the typology developed by Elman Service exemplifies types of political organization such as

number of bases of division rather than a one-dimensional set of classes. Another difference is that types may be reduced or expanded for analytical purposes.

A “type” constitutes the intersection – in set-theory parlance – of the  $n$  classes that are combined to form it (Marradi, 1990). A “taxonomy” is obtained when several bases of division are considered in succession rather than simultaneously. The concept of “rank” is used to denote the steps in any branch of the taxonomy from the top of the hierarchy.<sup>11</sup> A common feature of classificatory schemes, typologies and taxonomies is that the classes resulting from each classificatory principle must be mutually exclusive and jointly exhaustive.

## 1.2. Typology construction approaches and related methods

Having suggested using the term classification to refer to an actual operation, Marradi distinguishes two approaches: “intensional” classification and “extensional” classification. The former is associated with top-down or deductive construction approaches where the objects or events to be classified are handled on the basis of selected classificatory principles. In the latter, which can also be referred to as a bottom-up, data-based or statistical approach, the objects or events of a set are grouped into two or more subsets according to the perceived similarities of the states of one or several properties. Subsets can hence be grouped into successive subsets of wider extension and higher

---

“band”, “tribe”, “chiefdom” and “state”. In morphology, the typology created by Friedrich and August von Schlegel incorporates a combination of styles of morphemes in languages to typify them: the two main categories are analytic and synthetic languages. The typology developed by Ewart Oakeshott categorizes nine types of sword that existed in medieval times.

<sup>11</sup> Marradi (1990) gives the following example of taxonomy using religious denominations: “The first division should be between A: believers, and B: non-believers. Then A could be split into AA: believers in divinities, and AB: believers in spirits (animists). AA could be split into AAA: believers in monotheistic religions, and AAB: believers in polytheistic religions. AAA could then be split into AAAA: Buddhists, AAAB: Christians, AAAC: Moslems, etc.; AAB into AABA: Hindus, AABB: Jainists, AABC: Shintoists, etc. We would then probably have AAAAA for Theravada Buddhists, AAABA for Catholics, AAACA for Sunnites, etc. The fewer letters in the identification tag, the higher the level of generality. In order to somehow balance the extension of classes while retaining exhaustiveness, denominations should probably include several taxa of the fifth level (such as Catholics, Sunnites, etc.), several of the fourth (such as Shintoists, Israelites, etc.), probably two residual categories at third level (other monotheistic and other polytheistic), one taxon at the second (animists) and one at the first (non-believers).”

hierarchical level:<sup>12</sup> in other words the predominant criterion is to maximize homogeneity within classes and heterogeneity between classes, as with distance functions, using various classificatory principles simultaneously to lead to the consolidation of typologies rather than classificatory schemes. The larger the number of objects or events to be grouped and properties to be considered in grouping, the greater the need for some kind of electronic matrix-based organization of information to identify types; the process can also be carried out mentally provided not too many classificatory principles are considered at once. A third approach is a form of extreme intensional classification, known as “classing”, in which the classificatory operations involve the assignment of objects or events to particular classes, types or taxa rather than particular classificatory principles as in intensional classification. This kind of operation is often called “categorical assignment” (Marradi, 1990).

In an equivalent of these forms of classification, Whatmore (1994) identifies three methods for constructing farm typologies in the context of rural sociology – the positivistic, realistic and hermeneutic approaches. In the positivistic approach, types are identified by sorting empirical data: this is equivalent to extensional classification – the statistical or bottom-up approach – in which matrixes of data are needed to organize the properties of the objects and identify dominant characteristics within types. In the realistic approach, types are identified on the basis of theoretical assumptions of structural relations, which include interactions in the biophysical environment, social institutions and individuals or households (Emtage *et al.*, 2006). In this case, assumptions about the main characteristics of the objects or events of interest are used to select classificatory principles – the intensional classification or top-down approach. In the hermeneutic or experiential approach, types are identified by interpreting people’s reasoning about the meaningfulness of particular practices: in other words established classes, types or taxa rather than classificatory principles are established according to a particular set of beliefs or expert knowledge.

An example of the hermeneutic approach is found in Vanclay *et al.* (1998), who used an improved method to capture farming styles in a typology framework.

---

<sup>12</sup> According to Marradi (1990), it took twenty centuries for extensional classification to be intellectually accepted. This is surprising given that children learn the concept of classification through experiences that are unquestionably extensional – based on the grouping of objects – rather than intensional – based on the articulation of concepts. This was because extensional classification had to wait for the development of another intellectual tool – orderly recording of the states of a vector of objects on a vector of properties – to be transformed into a respectable intellectual operation in a scientific discipline, the progenitor of the data matrix.

They recommended the use of “emic” or ethnographic approaches whereby farmers described themselves in their own terms rather than being asked to rate verbal “portraits” of potential styles as being like or unlike themselves. Vanclay *et al.* (1998) attempted to modify the application of the farming styles methods to make them truly “emic” or ethnographic rather than impose experts’ interpretations of farming styles. Both the “emic” and “expert” interpretations belong in the hermeneutic approach, and usually lead to more precise understanding of farming styles or behaviours of farmers in a given context; the positivistic and relational approaches, on the other hand, seek a more rounded identification of agricultural types and are hence the commonest approaches in the literature.

There are specific methods that accompany the two main approaches. In intensional classification – the top-down approach – access to expert knowledge, historical trajectories, agrarian system diagnosis (FAO, 1999) and stakeholder interviews are required to establish advance assumptions about the structure of the typology and the main characteristics of the types. With extensional classification – the bottom-up statistical approach – the most common methods used include mathematical and statistical tools; if the amount of data collected is not too large, the process can be carried out without a computer. The aim is to identify the relevant classificatory principles in the set of objects or events to be typified; this may also be done by means of abstraction analysis. Common techniques include structure analysis, scalogram analysis, taxonometric analysis, test theory, latent profile analysis, factor analysis, discriminant analysis, principal component analysis and cluster analysis (Capecchi 1968). The last four are the most frequently used in recent years, particularly for large datasets (Even *et al.*, 2014; Alvarez *et al.*, 2014). The latter authors also describe the most widely used methods in both construction approaches:

- Expert knowledge. Construction of the typology is based on aggregating farms into clusters defined by local experts, informants or farmers (Giller *et al.*, 2011; Landais, 1998; Pacini *et al.*, 2013). This approach leads to the establishment of a common reference base (Landais, 1998), and generally requires little time or expense (Landais, 1998).
- Participatory rankings. This involves the ranking of households, usually according to wealth, by experts or the farmers themselves in a participatory process. Observable assets are important when ranking is based on wealth (Kebede, 2007).

- Step-by-step comparison of the functioning of farms (Capillon, 1993; Landais, 1998). This classification method is based on extensive data about farm families, objectives, history, production, management, economic results and biophysical constraints obtained from surveys. The grouping into types involves a step-by-step comparison of neighbouring farms. Landais (1998) gives details.
- Multivariate analysis, including ordination and clustering methods. This method can be seen as the quantitative equivalent of the expert-knowledge approach. Statistical methods such as analysis of principal components, multiple correspondence analysis, multiple factor analysis and multi-dimensional scaling are used to classify farms; ideally no hierarchy or preconceptions are projected on to them (Alary *et al.*, 2002, Giller *et al.* 2011). Such methods are also known as “dimension-reduction” or “data-reduction” techniques (Pacini *et al.*, 2013) because they can capture the complexity of farming systems by simultaneously considering numerous farm dimensions and highlighting a few dimensions that account for farm diversity (Alary *et al.*, 2002). Box 1 gives an overview of best practices in developing multivariate statistical analysis for the identification of types.

#### **Box 1. Multivariate statistical analysis**

Multivariate and cluster analysis are used to identify explanatory/discriminating variables and to group farms in homogeneous types. Multivariate statistics makes it possible to reduce the number of variables and preserve the maximum of the total variability of the sample. Different multivariate statistics should be used in accordance with the nature of the selected quantitative and/or categorical variables:

- principal components analysis (PCA) for continuous or discrete quantitative variables, as in Bidogeza *et al.* (2009), Sanogo *et al.* (2010) and Tittonell *et al.* (2010);
- multiple correspondence analysis (MCA) for categorical variables, as in Blazy *et al.* (2009);
- multiple factorial analysis (MFA) for categorical variables organized in multi-table and multi-block data sets, as in Alary *et al.* (2002);
- Hill and Smith analysis for mixed quantitative and qualitative variables, as in Rueff *et al.* (2012); and
- multidimensional scaling to build a classification configuration in a specific dimension, as in Pacini *et al.* (2013), Righi *et al.* (2011).

The first step in multivariate analysis concerns the selection of key variables, or setting up the data matrix. A check must be made to ensure that variables describing the same aspects of the system or the same classificatory principle are not over-represented and that the analysis is hence unbiased (Blazy *et al.*, 2009; Kostrowicki, 1977).

In PCS, all the selected quantitative variables should be standardized, using percentages for example "... to avoid the influence of different levels of variation due to the unit of measurement." (Pacini *et al.*, 2013). This precaution improves the comparison of variables with different units: cultivated area ranging from 0.5 ha to 2.0 ha, for example, or agricultural income ranging from US\$150 to US\$5,000 per year.

The MCA and MFA methods are sensitive to low numbers of observations or unbalanced classes, so it may be necessary to combine some classes. The independence of variables must be tested, for example with Pearson's chi-squared test. Strong correlation between two variables would give double the weight to the information they give in the multivariate analysis. MCA may be more difficult to interpret than PCA or MFA: the interpretability of MCA is higher when the number of selected variables is limited (preferably  $\leq 20$  variables; Hervé, 2011). Multivariate analyses are sensitive to outliers such as potential error or "exceptional" observations, so it is advisable to remove them from the analysis (Hair *et al.*, 2010). If "exceptional farms" are removed from multivariate-analysis, it may be useful to identify them in reports on the diversity of farming systems.

The number of axes – principal components or factors – for PCA, MCA and MFA can be determined according to a criterion fixed in advance such as the number of axes that explain a minimum of x percent of the variability "... usually 60 percent or higher ..." (Hair *et al.*, 2010), or, as observed by Hervé (2011) by using Kaiser's criterion for PCA – that all axes with an eigenvalue higher than 1 are chosen.

Cluster analysis groups farms into classes or types that are as homogeneous as possible. The two main methods are:

- non-hierarchical clustering – separation of observations/farm space into discrete groups or types where the number of groups ( $k$ ) is fixed; and
- hierarchical clustering – step-by-step aggregation of observations/farm space into discrete groups or types. Each farm is initially a group in itself, then the two most similar groups are merged and so on step-by-step until only one group with all farms remains. The visual result of these steps – the algorithm – is a dendrogram or classification tree. The height of the dendrogram branches represents the average distance or dissimilarity between the observations in the groups and between groups. The dendrogram hence provides a visual representation of the variability of data, and constitutes a useful tool for justifying the choice of a partition – that is, the number of clusters. The choice of number of clusters is a trade-off between reducing dissimilarity and increasing the number of clusters. The dendrogram could be partitioned on the basis of: i) the overall appearance of the dendrogram; ii) the number of clusters; iii) their interpretability; and iv) the examination of height delta. Starting from the top of the dendrogram – the highest level of height or "root nodes" – the structure suggests division into  $n$  clusters when the decrease of the level of dissimilarity passing from a  $(n-1)$  clusters to  $n$  clusters – that is  $\Delta\text{height}(n-1)$  to  $n$  clusters – is much greater than passing from  $n$  clusters to  $(n+1)$  clusters (Husson *et al.*, 2011). It is important to note that there is subjectivity in the choice of the partition, notwithstanding the use of a criterion such as  $\Delta\text{height}$  to support the partition.

The agglomerative hierarchical clustering algorithm is often used in the construction of a typology (Alary *et al.*, 2002; Blazy *et al.*, 2009; Pacini *et al.*, 2013; Sanogo *et al.*, 2010). The two clustering methods can be used together to combine their strength (Michielsens *et al.*, 2002; Iraizoz *et al.*, 2007): in the combination, hierarchical clustering is used to estimate the number of clusters, whereas non-hierarchical clustering is used to calculate the cluster centres. The number of farm types typically ranges from three to seven, with a median of five.

According to Alvarez *et al.* (2014), farm types emerging from multivariate statistical analysis should be validated by local stakeholders and initial hypothesis to ensure their relevance to experts, policy makers and farmers.

Source: Alvarez *et al.* (2014)

- Agrarian system diagnosis. The agrarian system is the sum of relationships between production systems and the social and economic organization of a society; professor Mazoyer<sup>13</sup> defines it as "... a mode of exploiting the environment historically created and sustainable, a system of production forces adapted to the bioclimatic conditions of a given space and responsive to the social conditions and needs of that moment ..." (quoted in FAO, 1999). The main unit of analysis is the farm household or family farm (FAO, 1999).<sup>14</sup> FAO defines the farm-household system in terms of: i) habitat, or the people living together – a decision-making unit establishing general goals for the system; ii) production, or the people working together – a decision-making unit establishing technical goals for farming systems; and iii) consumption, people eating together – also a decision-making unit. With regard to family farmers, the farm or production unit cannot be considered separately from the household. Focusing on the farm but not on the people managing it would impede understanding of the ways in which it works, its boundaries and its right to resources in its immediate vicinity and further afield (FAO, 1999). There are guidelines published by FAO in 1999 for computing net farm incomes that incorporate the main characteristics of farm households, particularly the connection between consumption and production and the imputing of opportunity costs to family labour; Saravia Matus and Gomez y Paloma (2014) give an example of assessment of the viability of family farms based on these. The guidelines also introduce the concept of "reproduction thresholds" to assess farm viability and compare this with poverty levels: the method involves: i) zoning and historical analysis of change in farms and agrarian structures; ii) selecting samples on the basis of preliminary

---

<sup>13</sup> An expert in agronomy and forestry, and Professor at Paris XI University; chief editor of the last agricultural Larousse, emeritus professor in agricultural development at the Grignon Agronomic National Institute, Paris; head of the department of Rural Economy and Sociology of the NARI from 1972 to 1975, and president of the FAO programme committee from 1983 to 1993.

<sup>14</sup> Studies such as Jouve and Tallec (1996) suggest that the unit of analysis can be taken at the village level, particularly if region-level conclusions are desired concerning the diversity and dynamics of use of the environment and the organization of the agrarian system.

typology analysis, building on (i); iii) in-depth farm household surveys; and iv) analysis of the economic model of each type of farm and trajectories of change. Secondary data to be collected include topographic maps, previous surveys, field observations and information from local informants. Findings are used to inform policy-making, and may be fine-tuned on the basis of feedback from local agents.

## 1.3. Theoretical challenges to typology building

### 1.3.1. Number and nature of classificatory principles

A controversial question in defining and building a typology is how many classificatory principles or bases of division are to be considered? This question applies whether an intensional or top-down or an extensional or bottom-up approach is used or even a combination of the two, and the answer is usually governed by the availability of the data and to some extent by the purpose of the typology (Alvarez *et al.*, 2014). In the case of typologies built for policy purposes, for example, it might be desirable to have five to eight types to facilitate decision-making (Even *et al.*, 2014). Even in the cases where the typology is not meant for policy purposes, fewer than ten types are enough to show the differences between types. If the typology has taxonomic objectives there may be 30 or more types and sub-types as in Kostrowicki (1992), who mapped agricultural types in Europe.<sup>15</sup>

The question above is complicated when the classes emerging from each classificatory principle are not dichotomous, which leads to an increase in the power, or number of types, in the typology (Marradi, 1990). If typologies have

---

<sup>15</sup> The choice of approach is conditioned by data constraints and/or the purpose of the typology. It must be borne in mind that each approach will deliver different results, even with the same dataset, and that the same approach used with different methods can lead to different typologies. In a statistical/numerical approach, for example, emerging types will be different according to whether a principal-component or cluster analysis is used to pinpoint identifying variables. In a deductive approach, the identifying variables will vary according to whether selection is based on field observation or expert local knowledge. Findings may also be different in a particular approach if the associated identifying indicators are different. Further analysis is required to establish the advantages and limitations of the methods of each approach; guidance is needed as to when to use particular approaches and when to combine them. Criteria for the selection of indicators are absent in the literature, which is largely data-driven.

high power, a “reduction of property space”<sup>16</sup> may be required, especially when emerging types have no conceptual interest or few observations. The opposite action is “subtraction of property space”, which occurs when typologies are presented without first defining the bases of division, in which case the bases have to be inferred or extracted from the intensions of the types. If authors do not highlight the classificatory principles, the resulting classes from each are often incorrectly identified – possibly in terms of their thresholds or the number of classes included – and so the number of types may not encompass all possible objects or events in the set under observation, which violates the rule of exhaustiveness. Reduction and subtraction of property space both serve to “clean” or improve the emerging typology.

It is important to be aware of the limitations of typology-based tools, which are rarely addressed in social science literature. One significant consideration is that the approaches on which typologies, classification schemes and taxonomies are based do not make assertions, and hence cannot be judged as “true” or “false”; they must therefore be considered as real rather than nominal definitions. As with stereotypes, typologies do not accurately reflect any single entity and provide oversimplifications of all entities: they are mechanisms for organizing and stabilizing our thoughts about reality, and may be used as exploratory tools to understand a situation or context and their usefulness depends on the purpose for which they are used (Marradi, 1990). Alvarez *et al.* (2014) argued that when typologies are used to understand farm diversity, a trade-off is made between the quality of the representation of reality and the level of detailed required; Kostrowicki (1964) argued that a type may be termed “close to reality” only when all units assigned to it fit all the specified

---

<sup>16</sup> Lazarsfeld and Barton (1951) distinguish between functional reduction based on the relationships between bases of division, pragmatic reduction based on researchers’ goals and balanced extension, and arbitrary numeric reduction, which reduces a typology to a classification scheme by assigning numerals to types and treating them mathematically. Capocci (1966) proposed a typology of reductions by combining two dichotomous bases of division: whether or not mathematical processes are used, and whether or not empirical evidence on the extension of types is considered. According to Marradi (1990), a researcher’s goals are – or should be – the primary consideration: they frame the evaluation of the degree of semantic proximity between bases of decision and between their classes, which in turn controls the process of aggregation of types. Semantic considerations, however, find a limit if the extension types are to be balanced: when a genus is articulated into  $k$  species, the ideal extension of each species is of course  $1/k$  of the extension of the genus; types exceeding that proportion should not be merged whatever their semantic proximity. In reduction, as in establishing the number of classes in a classification scheme, semantic proximity and balanced extension should be weighed comparatively.

classificatory principles. In any case, farm types cannot substitute definitions or official categorizations of farms because the latter may include elements that may not be subject to classification or division: in REAF (2010), for example, family farmers are characterized by their relationship with the agro-ecological setting. This characteristic is part of their identity and cannot be measured, nor can thresholds be established, to distinguish an individual property. In other circumstances official definitions of categories of family farms reflect political agendas: in Brazil, for example, family farms are defined as those within a given size limit that mainly use the labour of the family, which derives income mainly from the farm (Saravia Matus *et al.*, 2013a); the size threshold is related to the socio-political context of Brazilian rural areas, and is not suitable for type definition at the international level. Similar arguments can be made for denominations such as “hobby farm”, “peasant farm” or “smallholder” used in some countries: such terms are usually understood in specific contexts, and because they involve non-measurable political or social concepts they should not be used in the building of typologies.

### **1.3.2. Establishing a working vocabulary**

There is a wide variety of terms used to build types in the classification or construction approaches of typologies: as we have pointed out, the terms “classification” and “typology” are often confused and a variety of terms is used to denote the basis of division or classificatory principles, examples of which include: i) identifying/distinguishing criteria (Saravia Matus *et al.*, 2013a, Even and Saravia Matus, 2014); ii) attributes whether social, operational, production and structural (Kostrowicki, 1984); iii) dimensions (IIASA/IFAD, 2014); and iv) properties (May, 1982). Emerging types are sometimes referred as “classes” or “categories”, which obscures the fact that types are a combination of classes; and the latter term can embrace classes, types and taxa in a single concept (Marradi, 1990). Box 2 summarizes the main concepts.

## Box 2. Working concepts for typology building

**Classification.** Intellectual operation whereby the extension of a concept at a given level of generality is subdivided into two or more narrower extensions or classes corresponding to the same number of concepts at the lower level of generality (Marradi, 1990). To make such as concept divisible, a basis of division must be established, which is referred to as the *fundamentum divisionis*.

**Fundamentum divisionis.** This term, literally “the basis of division”, refers to the classificatory principle used to establish classes of a given concept. Other terms used are “identifying/distinguishing criteria” (Saravia Matus *et al.*, 2013a), “properties” (May, 1982), “internal attributes” (Kostrowicki, 1977) and “dimensions” (IIASA/IFAD, 2014;). Specific variables and indicators must be developed or selected for each classificatory principle or identifying/distinguishing criterion, a procedure often influenced by data availability. The basis of division can also be used to distinguish between a classification scheme, a typology and a taxonomy: in the case of classification schemes, classes are obtained by introducing a single basis of division, whereas typologies emerge when two or more are combined to build types; taxonomies are constructed when several bases of division are considered in succession to build ranks.

### Typology construction approaches

**Intensional classification / deductive / top-down.** This approach consists in defining types on the basis of existing assumptions or knowledge from sources such as expert inputs, literature reviews, historical trajectories, stakeholder interviews, field observations or policy objectives. The information is used to select in advance two or more distinguishing criteria to build types. This “top-down” approach may be developed with or without *a posteriori* validation from data or field-based feedback. Types may also be identified in advance in line in consultation with technical experts, local authorities or stakeholders; in this way they are closer to the categorical assignment or hermeneutic approach. The *a priori* qualitative classification can also be validated, documented, detailed and sub-divided on the basis of quantitative exercises, leading to a combined approach to constructing a typology.

**Extensional classification / data-based / bottom up.** In this statistical approach, the objects, events or data to be typified are explored with statistical tools or abstraction techniques to group individuals according to criteria determined through observation, analysis or quantitative methods. The goal is to derive homogeneous groups with little intra-group variability; high inter-group variability is enforced by using the data of the objects or events to be typified as the main source of information to guide the classification. The main statistical tests quoted in the literature for typology building are principal and multivariate analysis and cluster analysis (Even *et al.*, 2014). Cluster analysis can be defined as any of several procedures in multivariate analysis designed to determine whether individuals, cases or other units of analysis are similar enough to be grouped into clusters; the individuals in a cluster are similar for one or more variable, while the clusters are dissimilar from one another. A form of multivariate analysis – discriminant analysis – frequently found in the literature is a form of regression analysis designed for classification into predefined, mutually exclusive groups: it allows two or more continuous independent variables to be used to place individuals or cases into the categories of a categorical dependent variable. The results of an extensional classification may, in certain cases, also become a source of information in the advance definition of types in intensional classification approaches; this implies a combined construction approach.

**Combined construction approach.** This process builds on the methods of the intensional and extensional classification approaches to define types. The order in which extensional or intensional classification methods are used can vary, but there is a continuous loop between them in the sense that they are correlated and inter-dependent. In the combined approach, either: i) types are conceived in advance and statistical methods are used to verify that the assumptions fit the data; or ii) the data are used to identify classificatory principles and define types through intensional and extensional classification methods.

**Descriptive analysis.** Once types have been identified using classificatory principles or internal attributes, descriptive analysis is used to detail key characteristics on the basis of variables that have not been used to identify them. Descriptive variables can hence provide information about the territorial or external attributes influencing types. According to Kostrowicki (1992), external attributes include agro-ecological settings, policy or institutional settings or market conditions. Descriptive analysis can help to explain the evolution of type trajectories or provide background knowledge for policy evaluations. It is not necessarily restricted to qualitative assessment: indeed, statistical analysis of emerging types, which may include correlation analysis between descriptive criteria and other sets of tests such as the Duncan test, is encouraged (Even *et al.*, 2014).

**Agricultural holding and agricultural household.** An agricultural holding consists of the agricultural production activities of an enterprise, where an enterprise is a corporation, a government institution, or – most commonly – a household. An enterprise containing an agricultural holding may be engaged in production activities other than agriculture: a household may operate a shop or restaurant, for example, in addition to its agricultural holding. Other economic production activities may include fishing, collecting forestry products, crafts and family businesses that do not involve payment to employees. The reference period is normally the census reference year.

A holder may be classified in the “household sector” or “non-household sector”: holdings in the household sector are those operated by household members, either single-holding households or multiple-holding households; a holding may be a partnership of two or more households. In many developing countries, most agricultural holdings are in the household sector and known as “agricultural household holdings”; non-household holdings are those in sectors other than the household sector. Corporations and cooperatives are defined in the context of national law. Cooperatives include various organizations in which the principles of individual or joint ownership or leasehold are combined to various degrees. The other sector includes tribes, clans, private schools and religious institutions. Government holdings are agricultural production entities operated by a central or local government, either directly or through a special body (FAO/WCA, 2010, 2020).

The agricultural holding in the household or non-household sector is the preferred unit of observation for the consolidation of agricultural typologies, except for typologies intended to categorize farming systems (Dixon *et al.*, 2001). The agricultural holding is a unit of agricultural production under single management comprising all assets and factors of production used wholly or partly for agricultural production purposes, without regard to title, legal form or size. Management may be exercised by an individual or household, jointly by two or more individuals or households, by a clan or tribe, or by a juridical person such as a corporation, cooperative or government agency. The management type may be classed as household management or non-household management. The land may consist of one or more parcels located in one or more separate areas or in one or more territorial or administrative divisions, providing the parcels share the same management and means of production – labour, farm buildings, machinery or draught animals (FAO, 2005).

### **1.3.3. Variables for identification and variables for description**

Another problem in agricultural typology building is the distinction between variables that can serve as bases of division and those that can be used to enrich the description of types and explain their trajectories or transformations over time (Kostrowicki, 1986 and 1980). This is particularly relevant when the objective is to make typological findings comparable across regions or countries.

Seeking this comparability is not new: as documented by Kostrowicki in 1964, geographers and agricultural economists were seeking to establish agricultural typologies during the 1930s, 1940s and 1950s. A major limitation was that the studies could not be compared because the criteria for defining types varied from country to country and even from author to author in a single country; the confusion affected terminology, criteria and methods of classification. The identifying criteria used in the typological studies of the period can be grouped into categories in terms of connection with:

- I. ownership, tenure, subdivision and fragmentation of land;
- II. forms of utilization of agricultural land;
- III. agricultural production; and
- IV. income and standards of living of the agricultural population.

In this analysis, Kostrowicki raised the highly relevant issue of the distinction between variables suitable for identification and variables suitable for description or analysis of transformations of the identified types. The author stressed that only the first three of the above categories could be used for the identification of types and that the fourth one was only suitable for description. The organizational, technical and productive features of agriculture represented by the first three categories differentiate and determine types of agriculture; income levels and standards of living appeared to be secondary issues and subject to influences from outside agriculture such as government policies, prices, taxation, debts and revenue from non-agricultural activities. According to Kostrowicki (1964) the external natural, economic, social or technical conditions only determine the possibilities of agriculture and show why a given type of agriculture is utilized on a particular territory.

Kostrowicki (1992) identifies the following aspects or “internal attributes” as characteristics useful for identifying types (see Box 7):

- social attributes show who is the operator or decision-maker for a holding operator, and their gender, age and legal status;
- operational attributes show labour and capital inputs, the extent of farming intensification or extensification and how holdings are operated;
- production attributes show how much is produced and for what purpose; and
- structural attributes show the proportions of branches of agricultural production – land use, livestock breeding, gross agricultural output and commercial production.

Kobrich et al. (2003) argue that the relevance of a farm typology will depend on its ability to capture farm diversity, show maximum heterogeneity among farm types and obtain maximum homogeneity in particular farm types. Because a type is defined on the basis of similarities among individuals and individuals characterized by similar sets of attributes may occur repeatedly in time and space, the same types may be identified in various periods or territories (Kostrowicki, 1992), which allows the use of typologies to capture agricultural transformations. Kostrowicki (1992) therefore argued that the identification of types has to be based on internal – or inherent or endogenous – attributes that can support comparisons among different agricultural contexts and periods. The focus for the selection of classificatory principles or identifying criteria should be traits that are intrinsic to the organization of a holding rather than external factors or the environment in which it operates: it follows that external – or exogenous – attributes such as those related to the conditions in which agricultural activity takes place should not be used as a basis for agricultural typology even if they explain why particular types of agricultural holding have developed at a particular place and time. Such external attributes may include the agro-ecological, policy, institutional and market contexts. They must be assessed so that the development and spatial distribution of agricultural types can be understood and interpreted.

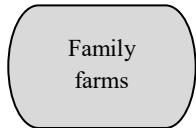
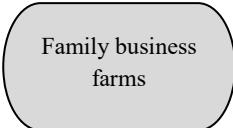
According to Kostrowicki (1992), however: “... the simultaneous use of such exogenous, natural and other conditions alongside endogenous attributes is futile since it presupposes rather than proves their impact on the formation of agricultural type.” He argues that this can be proved more convincingly by studying agricultural characteristics and their associations separately from the

conditions of their development, and subsequent analysis of interrelationships by means of correlation calculus. This analysis can be extended to include some of the outcomes associated with types that have been recognized as policy priorities: food and nutrition security or the socio-economic and environmental sustainability of holdings. Alvarez et al. (2014) discourage the use of external variables to identify farm types and recommend establishing a clear distinction between identifying and descriptive variables in typology building; they also state that the so-called external variables offer an excellent opportunity to test theories relating to the drivers of diversity.

Saravia Matus et al. (2013a) embraced the notion of internal and external attributes developed by Kostrowicki (1964, 1984 and 1992) and recommended by Alvarez et al. (2014). The distinguishing criteria in the WAW framework – labour usage, legal status and output orientation – relate directly to the operational, social and production attributes described by Kostrowicki (see Box 3). In terms of external attributes, some indicators have been selected to address particular policy priorities: WAW (2012), for example, developed: i) a list of variables used to describe and assess food security (see Box 4, part A); and ii) an indicative list of environmental, social and economic indicators used at the holding level to assess livelihood outcomes related to sustainability. The selection of such indicators is relevant to understanding how the context in which farmers operate and the nature of the external challenges they face (see Box 4, part B).

Kostrowicki's definition makes it clear that no type of agriculture should be defined solely on the basis of a single category of features such as social attributes or production attributes, or, as in WAW, the labour usage variable. Agricultural operations should not be taken to be of the same type because the same crops are cultivated in similar natural conditions, irrespective of other issues. In this context Kostrowicki (1964) cites Nicholas Helburn's 1957 paper *The Bases for Classification of World Agriculture*: "Wheat farming in North Dakota ... is much more closely related to cotton farming in West Texas than to wheat farming in Manchuria." On the other hand, types of agriculture that differ from one another in several ways should not be considered to be alike simply because they are situated in the same state and are therefore subject to the same economic policy (Kostrowicki, 1964).

**Box 3. Overview of WAW distinguishing criteria and thresholds**

Distinguishing criteria	Basic types and thresholds			
<b>Management type</b> based on variables of legal status and management	Household sector, operated and managed by household			Corporate management, hired manager
<b>Labour</b> based on variables of family vs hired labour	Mostly family labour  	Mixed family and hired labour, or at least one permanent worker  	Only hired labour  	
<b>Commercialization</b> based on variables of declared purpose of production or indicators of production systems and sales vs production	Subsistence and semi-subsistence	Commercial	Subsistence semi-subsistence*	Commercial
<p>* At first sight the existence of a semi-subsistence family business farm may seem odd, but it mainly relates to cases where the household holding has diversified its activities and farming operations may be subsidized by external livelihood sources.</p>				

**Box 4. WAW framework examples of external attributes related to policy priorities**

**Part A: Indicators used at the holding level to assess livelihood outcomes focusing on food and nutrition security (WAW, 2012)**

Food and Nutrition Security components and indicators (To encompasses multiple dimensions: availability, access, use or nutrition, and variability)	Synthetic analyses on
<b>Availability</b> 1. Annual agricultural production : quantity of food produce by person 2. Available production : quantity produced less quantity sold (including type of expenses) - intra consumption (seeds, feed) – gift – storage and transport wastes : ton or kg /person and per annual work units (by holding), in Kilocalorie (dietary energy supply (DES) in kcal/day by person), macro et micro nutrients. 3. Food productivity of labor : Equivalent Kilocalorie of net value added (calculated from the average price of primary products consumed by rural households in the area) by annual work unit 4. Share of land cultivated with staples crops (food crops) : 5. Land cultivated by women.	Availability
<b>Use/ nutrition</b> 6. Simplified index of Variety / Diversity of production: food (number of product types in relation to need), "cultural": number of products compared to local customs / national consumption. 7. Share of cereals, roots and tubers in total DES in% (a high% indicates low diversity of food supply) 8. Fresh food	Use  Overall Assessment of Food security at holding
<b>Food access</b> 9. Available production / needs for the family operation (kilo calorie, macro and micro nutrients) 10. Number of months of lean season for energy (cereals or tubers) 11. Income (total and on farm) per person compared to the food poverty line 12. Income (total and on farm) per person over the poverty line 13. Number of meals per day during the lean season / average number of meals 14. Share of food expenditure in total income 15. Access to drinking water	Access
<p>Note - This list is focussed on indicators related to crop production only. The final choice of indicators (Core and Supplemental) will be tailored to the main sources of local livelihoods (e.g. cropping, livestock, mixed etc) and determined in consultation with stakeholders. Synthetic analyses will be based, among others, on appropriately disaggregated (e.g. by gender) statistical summaries and local knowledge. Supplementary data would be collected as needed to assess the impact of intra annual variations (e.g. reflecting seasonal assets).</p>	

**Part B: Indicative list of indicators used at holding level to assess livelihood outcomes related to sustainability**

<b>Environmental</b>
1. Soil quality
2. Biodiversity; Conservation of indigenous plants and breeds
3. Water and quality of water
4. Energy
5. Agricultural conservative practice
6. Air quality
7. Climate change impact due to activities of the agricultural holding during one year
8. N&P emission potential
9. Manure storage and application
10. Plant protection activities of the holding during one year
11. N&P emission potential
12. Manure storage and application
13. Plant protection
<b>Social</b>
1. Employment (annual work unit) : family labour units; external labour units (permanent – temporary), gender
2. Annual work units (total and family) by cultivated area, cattle, K.
3. Average wage paid by annual work unit (employees) by education level and gender (benchmark average salary for agricultural work on the territory)
4. Farm net Income expressed per family labour unit
5. Farm net Income and total income by person
6. Net income by person compare poverty line
7. Number hours of works by week (employees)
8. Gap between men and women salaries
9. Land area managed by women; land owned by women
10. Use of child labour
<b>Economic</b>
1. Yields for main products (quantities per unit ha, animal, boat)
2. Cultural intensity (cultivated per year / total land, irrigated/equipped)
3. Rate of exploitation of the herd; Percent of breeding females (ruminants)
4. Production (quantity, value and kcal)
5. Production costs. (Expenses / quantity)
6. Input effectiveness: qty and Kcal produced / per unit of fertilizer
7. Net value added : (gross product – intermediate consumption – depreciation)
8. Capital productivity: Net value added / fixed capital used
9. Land productivity: Net value added / area of agricultural land
10. Labour productivity (apparent) by type of labour : Net value added / labour quantity (annual work unit)
11. Income : on farm by activity, off farm by activity

**Note:** Supplementary data would be collected as needed to assess the impact of intra annual variations (e.g. reflecting seasonal assets), and agricultural management practices.

## Main message – Section 1

The literature shows the importance of: i) consistent use of working concepts in which “classification” and “typology” are correctly used and classes, types and taxa are adequately identified; and ii) a science-based approach to typology building, which should ensure replicability and comparability among settings. A specific construction approach and selection of classificatory principles, if such terminology is selected, are prerequisites. If a combination of approaches is selected, the methods and the steps whereby they are introduced must also be clearly defined. Issues relating to the number of classificatory principles and their classes, the selection of methods in a combined approach and the distinction between identification and descriptive variables must be addressed.

# Overview of Agricultural Typology Exercises at the National, Regional and Global Levels

## 2.1. Overview of agricultural typology exercises at the national level

Saravia Matus *et al.* (2013a) review agricultural typologies developed at the country and regional levels. The findings show the main purposes of 180 typological studies covering 70 countries and the construction approaches, data sources and main identification variables used. This chapter considers the most relevant material and introduces recent references that include farm-household models as tools that also produce typologies for policy analysis at the local level.

### 2.1.1. Purposes and uses of national-level typologies

National or country-level typologies are constructed for purposes such as: i) informing economic, sociological, environmental, technical and historical analysis at different geographical scales; ii) documenting the diversity of agricultural systems and their relations with the socio-economic and ecological environment; iii) supporting the design of local, national and regional policies; and iv) identifying the beneficiaries of public or private aid programmes (Saravia Matus *et al.*, 2013a).

According Alvarez *et al.* (2014) there are four main reasons for developing farm typologies:

- I. targeting – the distinction between farming systems type is intended to identify interventions appropriate to each type;
- II. scaling out – understanding how appropriate interventions can be disseminated on larger scales;

- III. selection – supporting the selection of representative farms or average prototype farms for analysis;<sup>17</sup> and
- IV. scaling-up – supporting extrapolation of ex-ante impact assessments to larger spatial or organizational scales (Ewert *et al.*, 2011).

The authors emphasize that a farm typology depends on the research question: typologies can be constructed for a particular objective and limited area such as “improving forage supply in the highlands of Madagascar” or for a global objective and a broad zone such as “improving food security in the humid tropics”. The objective must always be kept in mind when a typology is constructed, particularly when selecting identifying variables or classificatory principles (Alvarez *et al.*, 2014).

Countries may also develop more generic typologies to categorize holdings into homogeneous groups with a view to: i) establishing cross-comparisons in time and space and monitoring transformations;<sup>18</sup> ii) establishing the distributional impacts of policy, market and technological developments; and iii) developing farm samples for surveys, as in the EU typology and INOSYS in France. Typologies can serve multi-purpose analysis: they may not be specific to a thematic question, but may attempt to identify types with different assumed levels of assets and strategies, resources permitting. In view of the time needed to build a robust classification system of agricultural holdings, it is important to facilitate the analytical work of institutions that often have to respond quickly to policy-related requests and cannot develop a complex classification approach for each question. In this respect, a basic framework that lends itself to swift reconfiguration to address various questions is most useful.

Agricultural typologies are often developed as by-products of farm household models, especially for ex-ante and ex-post evaluation of policies and interventions at the national or local levels. The main advantages of using farm household models are that they can provide detailed results at the household level and can capture the heterogeneity of behaviours among households. Because the model is adapted to a particular area and uses detailed household survey data, it can reflect local specificities more accurately. Household models have the drawback, however, of requiring extensive micro-level data, access to which is generally limited, and the small scale of analysis prevents the extrapolation of results to inform policy making at a higher level (IIASA/IFAD, 2014) (see Box 5).

---

<sup>17</sup> This step could also serve to enhance data collection in certain monitoring systems.

<sup>18</sup> ERS studies monitor key transformations (USDA, 2013).

### **Box 5. Farm household models and typologies at the national and sub-national levels**

An example of a typology of farm households resulting from the implementation of a farm household model is given by Louhichi and Gomez y Paloma (2014) for farmers in the two main agricultural regions of Sierra Leone. Most household models are applied at the sub-national level because of the extensive data requirements. The household's objective is usually assumed to be farm-derived profit or utility of consumption (IIASA/IFAD 2014).

The Olympe software for modelling farming systems\* has been applied in tropical agriculture (Penot *et al.*, 2014). It requires extensive data because it involves production-related and economic information that has to be collected for:

- the cropping system: crops are divided into annual crops, perennial crops with at least a five-year cycle and multi-annual crops such as banana, pineapple and cassava with cycles from one to five years, and any livestock system; and all off-farm activity not directly linked to agricultural or livestock production, including processing of primary products;
- operational costs: information concerning the cost of production, inputs, outputs and yields must be included; if externalities can be quantified they should be included at this level; labour requirements must be identified to calculate returns from labour, an important factor in decision-making;
- production system: this includes the decision-maker – the producer – and the strategy for the combination of production factors; all non-operational costs are considered; all sources of capital – income, off farm, credits, loans – and all other expenses must be included; family accounts and business accounts can be separated but must be recorded; and
- commodity prices: these should be collected, taking into account local and international variations that support the building of potential scenarios.

In terms of typological findings, the software user must define the identifying criteria for farm types in advance. An advantage of Olympe is that it enables analysis of potential trajectories by changing particular assumptions in the four information modules. According to Penot *et al.* (2014) two situations have been studied: i) resource management in a relatively closed area, using the example of water management in irrigated schemes in North Africa; and ii) traditional open agrarian situation – a sugar cane scheme in Reunion Island – with a variable number of smallholders with different degrees of diversification or intensification.

Another way of accounting for household heterogeneity in large-scale models is to disaggregate the household category into several representative household types corresponding to groups of households in a survey; this is a top-down approach in which types are determined in advance, also known as “categorical assignment” (IIASA/IFAD, 2014). Unlike household models, this approach does not account for the various behavioural responses of structurally different household types, but it does enable accounting for the uneven distribution of the welfare outcomes of government policies among household groups as a result of different factor endowments – capital and labour, with land sometimes isolated from other capital – income sources and consumption decisions. This method has been used mainly to analyse the effects of policy on household income. Examples of this kind of modelling tool include the social accounting matrix, MyGTAP and MIRAGE-Households (IIASA/IFAD, 2014).

With regard to typologies resulting from modelling tools, it must be borne in mind that the extensive data requirement limits implementation to the local level. The selection of identifying criteria is usually at the discretion of the user or, in the optimum scenario, based on expert consultation: this makes these typologies highly context-specific and context-driven, which in turn limits their capacity for accurate replicability at higher levels of aggregation. They are

nonetheless extremely useful for evaluating the effects of policies at the national and local levels.

\* Other software systems developed for various initiatives include the *Programme Unifié de Monitoring Agricole*, developed by the *Collectif Stratégie Alimentaire* and the *Confédération des Associations de Producteurs Agricoles* in Burundi.

### 2.1.2. Selection of construction approaches

The country typological studies reviewed in Saravia Matus et al. (2013a) show that the deductive, top-down or intensional classification approach leading determination of relevant types according to a limited number of classificatory principles is widely preferred when typology building relates to a particular policy objective; it is also appropriate in situations where no data or only partial datasets are available. This knowledge-intensive approach is based on a qualitative understanding of agricultural holdings, which often serve as the main unit for observation, and their trajectories or transformation processes. The statistical, bottom-up or extensional classification approach, which is data-based, requires access to reliable and comprehensive datasets, which in turn depends on a sound statistics system for agriculture, censuses and large-scale agricultural surveys such as the Farm Accountancy Data Network (FADN) in Europe. This particular approach is also demanding in terms of interpretation of ambiguous indicators and data-cleaning requirements; considerable statistical skills and software management capabilities are required. Emerging types are often specific to the nature of the typology exercise and are not accurately replicated, so when this approach is chosen the aim must be to disentangle the main classificatory principles from the available data (Saravia Matus et al., 2013a). It can be said that the typology is “data-driven” rather than “knowledge- driven” as in the deductive approach.

Saravia Matus et al., (2013a) show, in other words, that a combined construction approach is rarely advocated or implemented. Exceptions are INOSYS in France and the CGIAR/Wageningen university typology guidelines developed in Alvarez et al. (2014).

INOSYS has been applied to agriculture in France, particularly at the regional level, focusing on specific farming models such as the dairy and meat sector in Normandy. An interesting aspect of the INOSYS typology is that it combines deductive and data-driven approaches to identify types of farms. The deductive approach is guided by experts who are in direct contact with the farmers to be typified: their inputs are analysed to identify the distinguishing criteria to be used to build the typology. The quantitative aspect of the typology is then developed by drawing from all relevant data sources for the region in question

such as censuses and surveys. Emerging types from the data-driven approach are tested with the preliminary hypothesis, and adjustments are made accordingly. The common identifying criteria used, which ultimately depend on the nature of the region and production system under examination, include structural aspects, factors of production and cropping and livestock systems (see Table 1 of Chambres d'agriculture, 2012). The number of resulting types and sub-types in INOSYS is substantial and highly detailed, largely because typologies are developed from a cropping or production system perspective and guided by expert knowledge and data pertaining to the region in question. This in turn means that the resulting typologies are unique to the context and sector in which they were developed, and although the results may not be directly comparable with other agricultural regions, the in-depth knowledge resulting from the analysis is relevant to the policies implemented in the region.

The CGIAR/Wageningen university typology guidelines (Alvarez et al., 2014) propose the combination of expert knowledge obtained in a participative approach with multivariate statistics, and recommend a combination of deductive and data-driven approaches to build typologies that serve policy objectives; this is one of the few cases in which a dual deductive and data-driven approach is proposed. The use of participatory schemes in which stakeholders such as researchers, policy-makers and farmers provide an ex-ante description of different farm types is suggested as a preliminary step with the purpose of identifying the classificatory principles of the typology; it constitutes the deductive aspect of the typology building process. The next step is to design a sampling method for data collection and the selection or integration of the data sources, after which cluster analysis – a data-driven approach – is recommended to finalize the definition of types. A comparison of emerging types and initial hypotheses drawn from the deductive methods is required to make adjustments. These steps are summarized as follows:

- I. state the exact objective of the typology;
- II. formulate a hypothesis for the diversity of farming systems;
- III. select the variables characterizing the farming systems;
- IV. design a sampling method for data collection;
- V. cluster the farming systems, using multivariate statistics; and
- VI. compare the typology result with the hypothesis, and validate the typology with local experts.

### **2.1.3. Main classificatory principles or identification variables used**

From the literature review of national agricultural typologies in Saravia Matus et al. (2013a) six of the main classificatory principles for typology building were identified:

- labour usage;
- legal status;
- market orientation, diversification and specialization;
- land and business size;
- physical capital asset endowment; and
- gender.

These serve to build two kinds of typology, as argued by Alvarez *et al.* (2014): i) structural typologies based mainly on variables that describe resources and asset levels; and ii) functional typologies based on variables that describe livelihood strategies and household dynamics. The purpose of the typology ultimately drives the selection of variables to identify types.

#### **Labour usage**

Labour usage is often combined with criteria such as marketing and management, and is captured as part of legal status. This criterion was found in most country typologies, with the exception of North American and the Balkan countries. A major finding was that the exclusive use of family labour is not always a characteristic of farms with few assets, as in the case of recreational farmers who work for their own consumption or to supplement their main income. There are also three sub-types of small family farms in the United States –retirement farms, residential or lifestyle farms and farming-occupation farms; a similar situation exists in Europe. A common strategy among family farmers who have access to credit is to substitute external labour by machinery or to use herbicides.

#### **Legal status**

The literature showed that legal status is a widely used criterion where data are not readily available, particularly labour indicators. The legal status of a holding is often used as an easy way to supplement or corroborate the labour usage criterion because it makes it possible to distinguish between large individual or private holdings and corporate holding.

## **Market orientation, diversification and specialization**

### **Market orientation**

Market orientation is rarely used as a differentiating factor in the typologies of industrialized countries because most farms are well integrated into markets, but it becomes a fundamental distinguishing criterion in most typologies in developing countries, and it is identified as an essential – previously “core” – module in the WCA guidelines. The most direct indicator is obviously the answer to the question: “What is the destination of your outputs: market or self-consumption?”; the share of agricultural production sold is an even more precise indicator. This criterion offers several advantages: i) it is particularly appropriate for capturing agricultural transitions; and ii) it tends to be connected to diversification and specialization. This feature is illustrated by the typology in the South African Department of Rural Development and Land Reform (2009), which combines market orientation with off-farm activities to define in-transition types of holding in South Africa.

### **Diversification**

In all countries a significant proportion of agricultural holders are considered to be multi-active agents who may be involved in non-farm or off-farm activities. Information about diversification fits typologies focusing on the household level rather than the holding level where these different income sources may not be captured in agricultural datasets. Off-farm activity is a useful complement in terms of understanding the role of agricultural activities in a given household. In more practical terms, data on incomes are rarely detailed in national agricultural censuses or surveys related to agriculture and hence should not be used to classify holdings at the international level unless the typology refers specifically to agricultural households.

### **Specialization**

Specialization of production is a criterion for distinguishing factors in developing and industrialized countries, and it is included in the WAC essential modules. The main quality of specialization of production is its capacity to define categories – subsistence-level cereal crop holdings in Toulmin and Gueyes (2003), for example, or agro-pastoralists and para-agricultural farmers in Mbétid-Bessane (2003). But it can lead to highly specialized and precise types such as breeders of milk-fed calves.

## **Land and business size**

Land size is relatively easy to measure and is commonly declared in countries where private ownership prevails over customary rights. Land size may be the aspect with the largest number of indicators: examples include total area, cropland area, grassland area, wooded land area, utilized agricultural area and cultivated. The main limitation of land-size indicators is that they are highly context-specific and difficult to compare, for example in terms of investment per hectare.

Similarly, business size is an important distinguishing factor in official typologies in industrialized countries. In general, indicators of monetary value have major drawbacks, particularly in a context of fluctuating prices. The use of business size as a differentiating criterion also raises the question of how to establish international thresholds and comparisons in terms of measures such as standard gross margin, gross sales or gross cash income.

## **Capital asset endowment**

The human, social, physical, financial and natural capital asset endowment approach was initially developed to assess the livelihood options open to holdings in developing countries, and was applied in household-level typologies. According to Tittonell et al. (2005), the asset endowment component would be more useful if combined with indicators related to household agricultural strategy in developing interesting typologies: “An initial approach to classify farms based solely on resource endowment led to poor discrimination of resource allocation patterns. Adding information on production goals (e.g. self-subsistence, market orientation), the main types of constraints faced, position in the farm developmental cycle and main source of income improved the discrimination of farm typologies enormously.”

## **Physical capital: levels of equipment and access to agricultural technologies and services**

In the typologies reviewed the level of equipment was never quantified in monetary terms and tended to be context-specific. In Africa it was captured by distinguishing between manual labour and animal power; in Asia by recording improvements in irrigation systems, seeds and fertilizers. The level of equipment is not among the differentiating criteria in the typologies of industrialized countries, but it is used as a descriptive indicator – for example low-intensity or high-intensity irrigation systems in Italy (Longhitano, 2012), or

the proportion of Greek farms, by size, owning a tractor (Daskalopoulou and Petrou, 2002).

## Gender

In the literature review, gender variables were used in some typologies to identify specific constraints applied to men or women, which tend to be highly context-specific. Tittonell et al. 2010) stated that: "... complementary variables such as gender or marital status of the household head were not included in the Principal Component Analysis but used as criteria to refine the clusters later on." It would fit better as a secondary criterion to distinguish local types or sub-types.

Even though the above classificatory principles are the most common in the literature, their application is ultimately determined by the context in which types are built. Lopes and Helfand (2013) noted that the incorporation of widely used criteria at the international level required caution when adapting to the Brazilian context, which included legal aspects and transformation processes such as productivity gains for small farmers and the increasing importance of non-agricultural activities in rural areas. They also emphasize that the thresholds established for different identifying variables must be adjusted to capture the Brazilian reality.

## 2.2. Overview of agricultural typology exercises at the regional level

### 2.2.1. Diversity of regional tendencies in defining agricultural typologies

One of the most interesting findings of the Saravia Matus et al. (2013a) literature review of country-level typologies was that certain tendencies and typological frameworks could be observed at the regional level (IIASA/IFAD, 2014). The choice of identification variables to build the typological studies, for example, tended to be similar in particular geographical areas. The findings with regard to regional tendencies were based on a sample of typological studies:

- In high-income countries, official typologies rely on sophisticated indicators of sales and gross revenue to distinguish between small and large farms. There are also regional projects to establish comparable

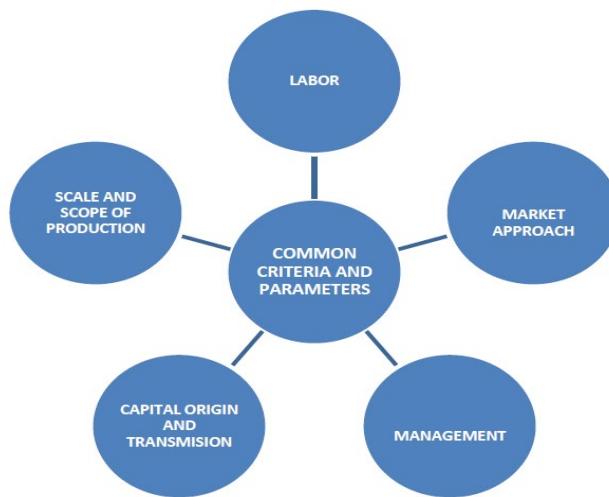
typologies of farms: the EU typology, which also accounts for type of farming and other gainful activities, is an example.

- In the Balkan states, official typologies are based on two criteria that are easy to collect: legal status and land size. Academic typologies are rare, and there are no regional projects to establish a common typology.
- In Africa the most common criteria for identifying types are related to cropping systems: crop cultivation or livestock rearing, and staple food crops or cash crops. This is related to the agricultural history of the continent – nomadic pastoralists coexisting with sedentary crop producers, and crops being produced by colonial institutions for export. Another common criterion is related to the subsistence farming and market-oriented farming categories. Official typologies are rare or non-existent, and there is no regional framework for typifying farms.
- In south-east Asia the main identification variables are related to the effect of the “green revolution” on farm transformation involving agricultural practices, technologies and equipment in particular, and also integration with input, output and labour markets as urbanization develops. Most typological studies in the region, which are conducted mainly at the local and national level, have been influenced by these transformations. No cross-border typological analyses were mentioned.
- In Latin America, common dimensions are size, source of labour, market integration, reproductive capacity and importance of off-farm income. Levels of capitalization and market integration also characterize farmers in the smallholder category. The countries most often mentioned are Argentina, Brazil, Chile, Mexico and Nicaragua. Work has been done to typify family farms from an international perspective: Rimisp/IFAD (2014), which was based on the use of family labour and income sources, is an example.

It must be emphasized that: i) these regional tendencies in typological studies are given for analytical purposes and do not accurately account for all forms of typological study in the regions mentioned; and ii) that the summaries do not imply that typologies in the region are comparable, but indicate tendencies in the way that types are defined and described. Straightforward comparison is not possible because of the wide range of indicators used and the ways in which they are obtained and combined to produce types; this is the case even when the same general criteria are applied. The different data sources and different scales of analysis used in the typologies reviewed prevent comparison, even in the same region, unless they are converted to fit a common framework.

The final report of the IWG-FF (Ramos, 2014) provided a regional analysis of the use of criteria considered to be relevant in identifying family farms and potential associated typologies. The criteria concerned were: i) labour by family or hired workers; ii) market approach in terms of own consumption, sales or engagement in the labour market; iii) management in terms of the identity of the decision-maker, who on a family farm is usually a male family member; iv) origin and transmission of capital, including access to physical and natural capital; and v) scale and scope of production in terms of size and type of production, though in some areas this criterion is part of the market approach dimension. One interesting finding was that depending on the region or area these criteria had different weights in the process of identifying family farms.<sup>19</sup> It was found that in low-income regions, the criteria related to labour and market approach were considered more important factors than in high-income regions, where aspects such as capital access and scale and scope of production served to identify types of family farms.

**Figure1. Selected criteria for identifying family farms and typology (IWG FF, 2014)**




---

<sup>19</sup> The regions studied were North America – Canada, Mexico and the United States – Latin America and the Caribbean, sub-Saharan Africa, the near East and north Africa, Europe and central Asia and Asia and the Pacific.

## **2.2.2. Examples of regional typologies and the role and purpose of “official” regional typologies**

Few regional economic entities have an official typology of agricultural holdings. The best example is the EU typology, which shows that a regional typology can fulfil various objectives and also facilitate analysis at the country level by: i) considering the diversity of production structures and systems in the EU to facilitate analysis of the structural characteristics of agricultural holdings and their economic results; ii) assembling homogeneous groups of holdings in a greater or lesser degree of aggregation so that comparisons of their situations can be made; iii) providing one of the bases for selecting statistically representative samples for farm structure surveys; and iv) contributing to the analysis and dissemination of data in the EU. It is hence an important tool for making data usable at the local, regional and national scales. A similar approach has been initiated by Mercosur with a view to setting up a regional categorization of the family farming sector (see Box 6), but it is at an earlier stage of development.

Table 7 sets out the identifying criteria used in some official and unofficial regional typologies.<sup>20</sup>

---

<sup>20</sup> The USDA typology is included because of the wide scope of its typological studies in 51 states.

**Table 7. Identifying criteria used for agricultural typological studies at the regional level**

Region/typology	Identifying criteria				
	Assets and economic size	Context	Labour usage and status	% of agricultural income	Production system
European Union	Economic size, based on standard outputs			Importance of other gainful activities	Type of farming (OTEX)
USDA*	Gross cash farm income		Family vs non-family farms, most of the business owned by the operator*		
Latin America and the Caribbean**	Asset endowment – poor, limited or rich	Development context – favourable, unfavourable			
Latin America and the Caribbean***			Family or non-family labour – 50% threshold	Level of agricultural income – 50% threshold	

\* Family farms in the USDA typology are further distinguished in terms of occupation – whether owners spend more than 50% of their work time on the farm.

\*\* Berdegué and Fuentealba (2011).

\*\*\* RIMISP/IFAD (2014).

## European Union<sup>21</sup>

Farm typologies are not new in the EU, where the presentation of agricultural statistics has been linked to a common typology for several decades. In 1965 the European Economic Community created the FADN, an annual survey in all member states that collects data on the physical and financial characteristics of

---

<sup>21</sup> Commission Regulation 1242/2008; Council Decision 79/65/EEC; Commission Decision 78/463/EEC; Commission Decision 85/377/EEC.

all types of farm to evaluate their performance and analyse agricultural activities.

The EU typology is a uniform classification of holdings by economic size and type of farming; these factors are determined by calculating standard coefficients. The typology was last updated in 2008 with modification of the method of calculating farm size and type of farming, and the addition of a third dimension reflecting the importance of other gainful activities. The classification now covers the economic size of farms and type of farming – the *orientation technico-economique de l'exploitation* (OTEX) – and other gainful activities related to a farm (European Commission, 2008). The methodological change replaced the standard gross margin criterion for determining type of farming and economic size with the standard output criterion with a view to reflecting more accurately changes in the support schemes of the Common Agricultural Policy. Standard output is calculated for each crop and category of livestock on the basis of average values over a reference period of five years. Each hectare of crop or head of livestock on a farm is multiplied by the corresponding standard output coefficient, and the sum of all the standard outputs gives the total standard output of the farm or the economic size of the holding. The second dimension – type of farming – is calculated by the relative contribution of the standard outputs for each activity to the farm's total standard output. The typology distinguishes three levels of specification depending on the amount of detail required – general farming, principal type of farming and particular type of farming. The first consists of nine categories: three for farms specializing in crops, two for farms specialized in animal production, three for mixed farms and one for “non-classified holdings”, which includes farms not covered by the other eight categories.

In the new “other gainful activities directly related to the farm”, farms are grouped in three classes according to the proportion of other gainful activities in total turnover – 0 percent to 10 percent, 10 percent to 50 percent and 50 percent to 100 percent. Although the recent EU farm typology is based on three dimensions, its background is exclusively economic: the determining factor in the classification is the relative distribution of farm incomes from different sources of production.

## **North America**

The USDA Economic Research Survey has developed typologies based on national surveys related to policy development and evaluation. In the latest update in 2013, two recent trends were captured: commodity price inflation and

a shift in production to farms with sales of US\$ 1 million or more. The original farm typology based its groups partly on gross farm sales, but inflation in prices for farm products and inputs such as feed, fuel and fertilizers has increased sales and expenses even when farm production has not changed, shifting some farms into different typology groups solely because of price increases. Adjusting sales for price changes corrects for these shifts.

**Table 8. Comparing original and revised typology of the USDA Economic Research Survey**

**Comparing the original and revised typologies**

Farm type	Operator's primary occupation <sup>1</sup>	Original typology	Revised typology
		<i>Farm size measured by gross farm sales</i>	<i>Farm size measured by GCFI</i>
<b>Small family farms<sup>2</sup></b>	Varies	Less than \$250,000	Less than \$350,000
Retirement farms	Retired	Less than \$250,000	Less than \$350,000
Off-farm occupation farms <sup>3</sup>	Nonfarm	Less than \$250,000	Less than \$350,000
Farm occupation farms:			
Low-sales	Farming	Less than \$100,000	Less than \$150,000
Moderate-sales <sup>4</sup>	Farming	\$100,000- \$249,999	\$150,000-\$349,999
<b>Midsize family farms<sup>2</sup></b>	Not a criterion	Category not used	\$350,000-\$999,999
<b>Large-scale family farms<sup>2</sup></b>	Not a criterion	\$250,000 or more	\$1,000,000 or more
Large farms	Not a criterion	\$250,000- \$500,000	\$1,000,000-\$4,999,999
Very large farms	Not a criterion	\$500,000 or more	\$5,000,000 or more
<b>Nonfamily farms<sup>2</sup></b>	Not a criterion	Not a criterion	Not a criterion

<sup>1</sup>Occupation at which the operator spent 50 percent or more of his or her work time.

<sup>2</sup>Family farms include any farm where the majority of the business is owned by the operator and individuals related to the operator. Nonfamily farms do not meet that criterion.

<sup>3</sup>Formerly residential/lifestyle farms.

<sup>4</sup>Formerly medium-sales farms.

The earliest versions of the typology were based on data from a 1995 USDA survey. By 2010 the producer price index for farm products had increased by 41 percent, so the revised typology adjusted by increasing the cut-off between small-scale farms and large-scale farms from US\$250,000 to US\$350,000 and by increasing the upper bound on farms with low sales from US\$100,000 to US\$150,000. To address the shift in production two classes for farms with sales of at least US\$1 million and sales of US\$5 million or more were added.

Gross cash farm income focuses on revenue actually received by the business and includes sales of crops and livestock, receipts of government payments and other farm-related income. The gross farm sales dimension differs from gross cash farm income in that it excludes other farm-related income and includes items that do not generate revenue such as the value of production accruing to

share landlords and production contractors, and government payments accruing to landlords.

The revised typology moderately increases the share of farms classified as “small”: 46,400 formerly large-scale farms with sales between US\$250,000 and US\$349,999 were re-classified into various small-farm groups, and 17,900 farms were moved to small-farm categories by the change to measuring size in terms of gross cash farm income. As a result the small-farm share of all farms increased from 88 percent to 91 percent: 2 percentage points resulted from raising the small-farm cut-off and 1 percentage point from the shift to gross cash farm income.

The increase in the small-farm share of production is more substantial: it increased from 16 percent in the original typology to 29 percent in the revised typology: 5 percentage points resulted from updating the small-farm cut-off for commodity price inflation and the remaining 8 percentage points from the shift to gross cash farm income as the measure of farm size. Using gross cash farm income in the revised typology moved US\$22 billion of production to small family farms, virtually all of it associated with production contracts.

Source: USDA (2013).

### **Farm classification systems for North American agriculture**

Nagelschmitz *et al.* (2013) observed that Canada, Mexico and the United States do not have a common farm classification system other than the North American Industrial Classification System, which they developed shortly after the inception of the North American Free Trade Agreement. As international agricultural markets become more integrated, however, internationally harmonized farm classification systems are being seen as practical tools for comparing national agricultural industries and for analysing micro-level data. The authors recognize that the increasing complexity of farm classification calls for exploration of systems that incorporate characteristics in addition to size and type of income such as “degree of specialization” and “intensity of land use”. International collaboration will be needed to satisfy the data requirements for an internationally harmonized classification system, which would facilitate comparisons between countries and inform discussion of the structure and performance of agriculture in different regions, and could also facilitate the identification of best management practices and similarities that might otherwise be overlooked (Nagelschmitz *et al.* 2013).

#### **Box 6. The Reunión especializada sobre agricultura familiar**

Work in Mercosur on definitions of family farming as a category for further policy support was organized under REAF, which was established in 2004 and meets twice a year. The forum aimed "... to promote political dialogue between governments and the organizations that represent Mercosur FF for the harmonization and design of differential policies that could reduce asymmetries that prevent FF from harnessing the potential benefits deriving from regional integration. REAF provides advice to the Common Market Group on specific topics of its areas of expertise." REAF provides recommendations for public policies and instruments favouring family farms, which have been adopted by the Mercosur countries.

An important basis of the work was a shared definition of family farming. REAF provided a definition of the family farm and common principles for Argentina, Brazil, Paraguay and Uruguay that could be adapted to their national contexts and used to promote family-farm production and trade in the region and to establish farm registries. The work also supported dialogue and facilitated exchanges of good practices.

The Common Market Group, the highest body in the Mercosur directorate, defines the following common criteria for identifying family farms: i) the labour engaged on the farm will be primarily family members, with limited employment of hired workers; ii) the family shall be directly responsible for the farming activities and shall live either on-site or nearby; and iii) the production resources used shall be compatible with the family's working capacity and the activity developed, and the technology employed should be in keeping with each country's situation. The four countries incorporated thresholds of minimum share of income from agriculture of 50 percent; the figure for Brazil was 70 percent.

In June 2010 a technical group was set up to: i) "... advance discussion of the issue (of family farm recognition and definition) and mutual knowledge about the mechanisms controlling the family farming records/farm registry..."; ii) analyse the compatibility and diversity of the parameters used in the records; iii) identify the observations of each delegation on the records of their peers; and iv) relate parameters that help to validate the third criterion on productive resources compatible with the working capacity of the family.

### **Latin American typologies for the family farming sector**

Berdegué and Fuentealba (2011) focus on the categorization of family farms in Latin America, and use the two essential criteria of functional typologies – asset endowment and context. The result is a categorization of the family farming sector in three large groups: asset-poor smallholders in contexts that are not conducive to development, asset-limited smallholders in more favourable contexts and asset-rich smallholders in favourable contexts. The focus is on farmers' capacity to move out of poverty through agricultural development. The identification of types was based on a deductive, top-down intensional approach, one of whose main advantages is simplicity with regard to the number of types.

RIMISP/IFAD (2014) acknowledges the work initiated by REAF, and introduces three criteria for identifying types of family farm in case studies in Brazil, Chile, Colombia, El Salvador, Ecuador, Mexico, Nicaragua and

Guatemala. Like the criteria proposed in the REAF definition, their proposal rests on a combination of criteria based on whether family or non-family labour is employed, place of residence and the level of income generated by farm work or production in each agricultural or silvo-pastoral unit. In Mexico the threshold of family labour usage was set at 50 percent to distinguish between family and non-family farms. In Brazil the established definition of family farm was used to identify the sector (see Saravia Matus *et al.* [2013a] for a revised definition of family farming in Brazil).

For agricultural income the threshold was set at 75 percent for family farms with a predominantly agricultural income, called “specialized family farms”, and 25 percent for diversified or multi-activity family farms; zero agricultural income corresponds to rural family households with no agricultural production. The main difference is that these definitions are broader than those proposed by REAF in that they include specialized family farms, multi-activity farms and households with no agricultural production. Comparisons between countries are not practicable because of differences in the measurement of agricultural income and the national definitions of family farming, but the typology nonetheless offers a valuable overview of the role of family farmers and the various diversification and specialization strategies in each country.

The synthesis report on this study does not acknowledge the intensional approach used in building the typology, but the selection of classificatory principles – particularly the use of agricultural income thresholds – is relevant to policy-making in that it identifies the livelihood strategies used in this segment of the agricultural sector in each country. An important recommendation relates to the need to “... improve databases and standardize methodologies and information sources on family farming, not only on definition but also on specific ways to access data and develop data collection techniques ...”, which would facilitate regional comparison and analysis.

Building on experience in the EU and Latin America and the resulting recommendations, further development of a common regional classification system for family farms might involve seeking agreement among participating countries to include particular criteria in their statistical systems, disseminate data in comparable tabulations and adapt their data-collection mechanisms accordingly, as has been done in FADN.

## **2.3. Overview of typology exercises at the global level**

### **2.3.1. Global typologies: purpose, users and scope**

As highlighted during the IYFF (FAO, 2014) there is a need to develop common criteria and guidelines for countries establishing accurate definitions and typologies of family farms at the national and regional levels and, to facilitate the acquisition of the relevant data and statistics on the economic and demographic dimensions. This will enhance pro-FF policy initiatives requiring the selection of targeted beneficiaries and typologies.

Family farmers' production of food, feed, fibre and fuel and their contribution to ecosystem services and the "carbon footprint" cannot at present be fairly estimated. A common framework would make it possible to align objectives and promote support for the various types of family farms in comparison with other forms of farming; it would also eliminate the gap that currently prevents comparison and estimation at the national level when agricultural census data are used: recent FAO studies, for example, found that 90 percent of the world's 570 million farms can be considered as family farms occupying 70 percent of all farmland, but more accurate estimates could be made if agricultural censuses included the criteria required to investigate the family farm sector.

Greater harmonization of agricultural data among United Nations agencies would significantly improve inter-agency coordination, and governments and development agencies would benefit from enhanced access to data enabling detailed analysis of agricultural holdings and comparisons in terms of regions and time. The advantages include:

- enhanced policy-making with regard to the needs of family farms and diversification of family-farm programmes and policies on the basis of the typologies;
- accurate monitoring and reporting of policy implementation and outcomes;
- enhanced capability for producing statistics on family farming at the national and regional levels with a view to providing a homogeneous database;
- research initiatives adapted to the challenges facing family farmers;
- extension and rural services that are targeted more effectively to family farmers;
- public support for innovation, taking into account the characteristics of family farming at the national and regional levels; and

- harmonization of the work of development agencies and other stakeholders concerned with family farming.

The potential number of users is large: it includes governments, United Nations and other international organizations, policy analysts, funding bodies, private-sector associations and the academic world.

In terms of the development of international typologies of agricultural holdings that include family farms, most of the major actors are international or regional organizations or academic institutions. The aim in all cases is to produce global assessment reports on agricultural development that include descriptive modules and that are integrated into a global policy model.

Common typological frameworks are important in that they enable comparison of results among countries and levels of aggregation beyond the national level. This enhanced compatibility facilitates international policy dialogue, as in the EU and Mercosur, but it could also generate national challenges. Because compatibility relies on internationally comparable datasets and tabulations, these mechanisms are usually proposed by international statistical bodies: FAO and its partners, for example, have proposed an international classification of producers and land use, and have provided definitions of agricultural holdings and households that facilitate the identification of sub-segments of international typologies, with harmonized land measurements in hectares. But no classifications have been proposed for more integrated typologies of agricultural holdings combining production systems and economic class sizes.

IIASA/IFAD (2014) reviewed global typology exercises that do not necessarily focus on the agricultural holding as the basic unit of observation, and that tend to combine intensional and extensional classification approaches and identify various elements from farming systems to agricultural development paths. The report shows that frameworks for typifying agriculture at the global level can be classified in terms of the identifying criteria used: there are, for example, global typologies that use agronomic criteria and exercises that use economic criteria. It must be emphasized that few global typologies aim to connect the macro level and the micro level in an explicit manner because the focus is not usually on the agricultural holding level; in this respect the WAW framework is a notable exception. In this section, global typological studies are therefore classified on the basis of the unit of analysis and their capacity to connect the global, national and local contexts. The typology construction approaches are also reviewed to elucidate the nature of combined-approach strategies.

### **2.3.2. Global typologies based on farming or production systems**

Global typologies based on farming or production systems are based primarily on agronomic criteria; the IIASA/IFAD typology, which combines agronomic and economic criteria to typify farming systems, is an exception.

Dixon *et al.* (2001) proposed a framework in which farming systems were grouped in 72 types, constituting a population of individual systems with similar resources, enterprise patterns, household livelihoods and constraints, for which similar development strategies would be appropriate. Depending on the scale of analysis, a farming system could encompass a few dozen or many millions of households.

The typology of farming systems was based on the following criteria: i) available natural resource base – water, land, grazing areas and forest; ii) climate, of which altitude was a significant determinant; iii) landscape – slope, farm size, tenure and organization; and iv) dominant pattern of farm activities and household livelihoods –crops, livestock, trees, aquaculture, forage, processing and off-farm activities. The technologies used, which determined the intensity of production and integration of crops, livestock and other activities, were also taken into account. Using these criteria, eight categories of system were identified: i) irrigated farming embracing a range of food and cash crop production; ii) wetland rice-based farming that depends on monsoon rains supplemented by irrigation; iii) rain-fed farming in humid areas with high resource potential characterized by root crops, cereals, industrial tree crops and commercial horticulture, or mixed crop/livestock systems; iv) rain-fed farming in steep and highland areas, frequently mixed crop-livestock systems; v) rain-fed farming in dry or cold low-potential areas with mixed crop-livestock and pastoral systems and dispersed systems with low current productivity or potential; vi) dualistic, or mixed large commercial and smallholder farming in a variety of ecologies and with diverse production patterns; vii) coastal artisanal fishing, often mixed farming systems; and viii) town-based farming systems, typically horticulture and livestock production.

In view of the number of classificatory principles and indicators the construction approach was largely data-driven,<sup>22</sup> but because a definition of

---

<sup>22</sup> The names of the farming systems reflect their identifying criteria: i) water resources – irrigated, rain-fed, moist or dry; ii) climate – tropical, temperate or cold; iii) landscape – relief and highland or lowland; iv) farm size; v) production intensity – intensive, extensive or sparse; vi) dominant livelihood source – root crops, maize, tree crops, artisanal fishing or pastoral;

farming systems was superimposed to guide the initial selection of a large set of classificatory principles and indicators, it can be argued that a deductive and a statistical development process were applied, the former to select identifying variables in advance, and the latter to define the emerging types.

Cassman *et al.* (2005) produced a typology that identified the main cultivating systems worldwide: i) shifting cultivation in the forest margins of tropical Africa, Asia and Latin America; ii) irrigated lowland rice systems in Asia; iii) irrigated rice-wheat systems in the Indus and Ganges plains of India, Pakistan, Nepal, Bangladesh and south-central China; iv) rain-fed wheat in northern, western and central Europe; and v) rain-fed maize and soybean systems in Argentina, south-central Brazil, south-eastern Canada and the United States. It was developed on the basis of the agro-ecological and enterprise/management contexts. The former was defined in terms of tropical or temperate conditions – day length, radiation and thermal differences and humidity or aridity related to rainfall and transpiration. Highland and mountain cultivation systems in tropical areas were also distinguished.

Cultivation enterprises were divided into four crop-based categories – irrigated, high external-input rain-fed, low external-input rain-fed and shifting cultivation – and “landless” livestock production and freshwater aquaculture. Combining the agro-ecological and enterprise/management dimensions generated a matrix into which most of the world’s cultivation systems could be categorized (Cassman *et al.*, 2005). Because the classificatory principles were selected in advance and the power of the typology was not large, a straightforward deductive approach based on expert knowledge was used to identify the types of cultivation systems.

Hazell and Wood (2008) developed a farming system typology to explore the linkages between human needs, agriculture and the environment. They first identified the two main determinants of food security at the country level – per capita income and agricultural productivity – and then developed a classification of agricultural domains based on the typology of Dixon *et al.* (2001).

Seré and Steinfeld (1996) developed a classification of livestock production systems that identified ten categories on the basis of three criteria: integration with crops, relation to land and agro-ecological zone; a supplementary category

---

vii) dual-crop livelihoods – cereal/root or rice/wheat, with “mixed” denoting crop/livestock; and  
viii) location – forest-based, coastal or urban (Dixon *et al.*, 2001).

was created by splitting the landless category into landless ruminant and landless monogastric systems. To distinguish between systems based on livestock production only and a mixture of livestock and cropping, they set quantitative thresholds for livestock food sources – pasture, forage and purchased feeds, or crop by-products – and for the proportion of the total value of production from non-livestock activity; this constituted the first criterion. The second criterion – relation to land – differentiated landless systems from grassland systems in the livestock-only group. The indicators were the proportion of farm-produced forage fed to animals. The agro-ecological criterion defined two groups of mixed-farming systems – rain-fed or irrigated – with a further split into three sub-classes depending on the agro-ecological zone. Steinfeld et al. (2006) suggested that two additional criteria should ideally have been considered: intensity of production, and type of product. This typology was built using a top-down approach in that the selection of classificatory principles, indicators and thresholds were determined in advance by the authors.

The IIASA/IFAD (2014) typology combined agronomic and economic criteria, but its aim was to typify farming systems. In IIASA/IFAD (2014) the dimensions used to build global agricultural typologies include agro-ecological context, dominant livelihood source, intensity of production activities, farm assets and land area, and level of commercialization. Deductive approaches were usually used to select the classificatory principles, whereas data-driven approaches were used to define types in the large number of resulting classes. The authors selected four dimensions to build a functional typology of farming systems, using a deductive approach focusing on production and economic criteria.

The typology, which had to be aligned with the Global Biosphere Management Model focusing on the economic use of land, was intended to enable analysis with allowance for transitions from one farming system to another. With regard to developing the identifying dimensions, the agro-ecological zone concept was introduced to capture the biophysical and climatic environments which underlie many constraints and opportunities. The distribution of agro-ecological zones, which is influenced by climate change but not by policies or farm practices, was assumed to be a static component of the typology; no significant changes in the distribution of agro-ecological zones were envisaged until at least 2050 in simulations set up in the model. Because farming practices vary in different agro-ecological zones, policies must be adapted accordingly.

The crop-livestock mix reflected farmers' preferences for certain crops or livestock raising, depending on the agro-ecological and economic context: the most common distinction was between farmers growing crops and those raising. Further disaggregation among these categories depended on the dominant crops or dominant livestock feed source, which were usually grounded in local or family history and influenced by the agro-ecological zone and knowledge accumulated through experience. Changes in the crop/livestock mix were usually limited in the short term unless there were external interventions to develop new value chains and promote the adoption of new species in response to new markets. Because this type of intervention was not accounted for in policy scenarios, it was assumed that the crop/livestock mix was also a fixed component of the typology. In any country or region, expert knowledge from literature reviews or interviews are probably the best approach to setting up policy-relevant farm groups on the basis of agro-ecological zones and crop/livestock mixes.

The degree of market integration is the dynamic component of our typology. The three categories of farming systems are: "low market integration" for subsistence systems whose production is mainly used for own-consumption and less than 10 percent is sold, "medium market integration" for semi-subsistence systems where between 10 percent and 50 percent of production is sold, and "high market integration" for commercial systems where more than 50 percent of production is sold. The degree of market integration leads to different behaviours: whereas commercial farms behave like businesses with a view to maximizing their profits, the main objective of subsistence farmers is to produce enough food for the family.

The degree of market integration will be the main indicator for tracking smallholders' transformation pathways in our analysis; the empirical literature shows that it is highly correlated with farmers' food security and poverty status. Targeted policies that can help the transition to higher market integration will be the focus of scenario building. Farm size and the share of family labour are used to separate commercial farms into two categories: small and middle-sized family farms that belong to the smallholder category, and large-scale corporate farms. It is assumed that the latter are important actors in the agricultural sector and that they will affect smallholders' transformation pathways. It is assumed, however, that the transformation of subsistence, semi-subsistence and smallholder farms into large-scale corporate farms is not possible. Because this is a work-in-progress, the actual typology is not yet available.

Most global typological exercises based on agronomic criteria are intended to typify farming systems; they are largely inspired by Dixon (2001), who relies in a combination of deductive and statistical approaches. The IIASA/IFAD typology, which combines agronomic and economic criteria and aims to identify farming systems, is also based on a combined approach. Although the typologies of farming and production systems can be used to understand the context in which groups of farms operate, it is not sufficient to capture differences among agricultural holdings in the same farming or production systems: to achieve that, the analysis must be made at the level of the agricultural holding.

### **2.3.3. Global typologies based on strategies, development pathways or rural settings**

It is interesting to find among the global typologies based on economic criteria listed in IIASA/IFAD (2014) work aiming to typify livelihood strategies, investment behaviours, development pathways, rural settings and potential trajectories. These studies include World Bank (2007), which built a categorization of smallholders' livelihood strategies on the basis of a single criterion – the main income source – and obtained five categories:<sup>23</sup> i) market-oriented smallholders who derive most of their income from marketing; ii) subsistence-oriented farmers who depend on farming for their livelihood and use most of their produce for home consumption; iii) labour-oriented households that derive most of their income from paid labour in agriculture or the non-farm sector; iv) migration-oriented households that choose to leave the rural sector entirely or depend on transfers from family members who have migrated; and v) households that combine income from farming, off-farm labour and migration. The authors drew attention to the fact that the relative importance of each category is different in the agriculture-based, transforming and urbanized scenarios.

OECD (2006a) suggested a typology of five “rural worlds” to guide policy-makers with regard to the diversity of rural and agricultural systems in developing pro-poor policies; it was based on level of commercialization, land ownership and poverty level. Three of the rural worlds corresponded to smallholder farming: no. 2 – traditional households and enterprises that are not internationally competitive; no. 3 – subsistence households and micro-enterprises; and no. 4 – landless households. Rural world no. 1 related to large-

---

<sup>23</sup> It could be argued that because a single identifying criterion was used the product was not a typology but a classificatory scheme of smallholders based on income source.

scale agriculture, and no. 5 to chronically poor households that were probably not economically active. Interestingly, the typology was associated with a review of the risks faced by each category and related mitigation measures (OECD, 2006b). The construction approach of this typology was closer to the hermeneutic or experiential type because the rural worlds were based on complex predetermined settings. In such exercises the classificatory principles are obscured to some extent by the complexity of the developed types.

HLPE (2013) built a typology based on criteria that help to facilitate or impede smallholders' capacity and willingness to invest in agriculture. The factors underlying investment decisions were grouped in three dimensions: asset-related, market-related and institution-related constraints to investment; the latter involved institutions, policies and power relationships. The different combinations of constraints defined eight typical situations, each requiring different actions to foster investment. The authors also showed how development trajectories modified modes of dealing with the constraints. Intensional classification was the main approach used to develop this smallholder typology, which was intended to capture investment behaviours.

Fan *et al.* (2013) introduced a country classification – agriculture-based, transforming or transformed economy – and three forms of smallholder farming: i) subsistence, without profit potential; ii) subsistence, with profit potential; and iii) commercialized smallholders. The aim was to typify eight types of development pathway, each associated with specific strategies and interventions. The action of crossing or combining classificatory principles is typical of a deductive or top-down approach.

### **2.3.4. Global typologies based on agricultural holding units**

Pingali and Rosegrant (1995) defined a tri-modal typology based on the level of market integration, which according to findings presented in Section 1 should be called a “classification scheme” because only one classificatory principle was used to develop its three classes: subsistence systems, semi-commercial systems and commercial systems. This was clearly based on an intensional classification approach that was closer to a “categorical assignment” in that the resulting classes were determined by the classificatory principle.

FAO (2014a) offered a classification similar to that developed by Pingali and Rosegrant (1995), with the addition of farm size as classificatory principle. Three types emerged: i) large family farms – large business ventures managed by a family and using mostly family labour; ii) small-sized or medium-sized

family farms that were market-oriented and commercial or had the potential to become so; and iii) subsistence or near-subsistence smallholders, who produce essentially for their own consumption. In view of the intension of these types, it is evident that a deductive or top-down approach was used. It should be noted that this typology focused on family farms and excluded non-household agricultural holdings from the analysis.

Brooks *et al.* (2008) established a comparable typology of family farms in developing countries with a view to building a disaggregated rural economy-wide model. The typology accounts for factor ownership, access to markets and households' roles as producers and consumers. Its four types were: i) commercial farms on large landholdings that behaved as businesses rather than households; ii) net-surplus-producing family farms typical of small farms of medium productivity; iii) subsistence and below-subsistence household farms typical of low-productivity agriculture; and iv) landless rural households. The typology was built on the basis of an intensional classification. In view of their number, the types were probably pre-determined to some extent; the non-household agricultural sector was excluded.

Brooks (2011a, b) extended this typology by integrating the development policy evaluation model to account for the heterogeneity of the rural sector by distinguishing between six household types; it was tested in several developing countries. It considered that three issues determined the effects of a particular policy in households of different types: i) the extent to which different households were involved in activities affected by the policy, and the elasticity with which they responded ii) the degree to which different households were net producers, net consumers or subsistence producers; and iii) the strength of factor and commodity market linkages, which transmitted the effects of policies differently in households of different types. They determined that the welfare effects of agricultural policies were qualitatively different on non-farm and farm households, as illustrated by the negative effects of most *marché public simplifié* policies on non-farm welfare. This was an important finding, in that an increasing share – in many countries the majority – of rural households are non-agricultural. The main exceptions occurred when non-farm households benefited from market linkage effects such as wage labour opportunities created on commercial farms. There were several cases where the effects of price support for cash crops on welfare in non-farm and remote households was positive. There was also evidence in farm households that agricultural support policies favoured large commercial farms and that in most of the policies considered the average welfare benefits for small farms were lower than those

for medium and large farms. Remoteness of location generally limited the flow of benefits, but even subsistence producers not affected directly by such policies were affected indirectly through demand for labour by commercial farms.

CIRAD (2013) developed a farm classification scheme of family, family business and corporate farms; these are not mentioned in IIASA/IFAD (2014). The main difference between the CIRAD proposal and the WAW typology was that in the former the three types of farms were identified on the basis of labour usage alone: family farms were therefore identified as holdings where family labour was used along with occasional temporary labour. The presence of at least one permanent worker was used to distinguish between family and family business farms, and corporate farms were those where 100 percent of labour was hired. One of the problems of this classificatory scheme was that the intension of the types included other hidden classificatory principles such legal status that divided holdings between household and non-household types: a household holding where 100 percent of the labour was hired, for example, should not be considered “corporate” because the name suggests non-household management. The concepts of family, family business and corporate farming introduced in CIRAD were further developed in Even *et al.* (2014).

The WAW international typology of agricultural holdings is an ongoing initiative that combines intensional and extensional classification approaches; its unit of analysis is the agricultural holding in the family and non-family sectors. With a view to simplicity, three identifying criteria are proposed: i) feasibility, data availability and cross-country comparability; ii) management style and legal status; and iii) source of labour, level of commercialization and market integration (Saravia Matus *et al.*, 2013a). This produced more accurate definitions of family, family business and corporate farms: the family farming sector, for example, is aligned with the FAO definition agreed during the International Year of Family Farming, which states that family farming is a means of organizing agricultural, forestry, fisheries, pastoral and aquaculture production and that it is managed and operated by a family and predominantly reliant on family labour. The family business farming sector comprises holdings that are household-managed but whose labour is supplied from a mix of family and hired sources; production may for commercial purposes or subsistence, and a hired manager may sometimes be present. The corporate farming sector comprises holdings under non-household management using 100 percent hired labour that are commerce-oriented, usually specialized in a particular

agricultural activity; it includes cooperatives, associations, corporations, planting pools<sup>24</sup> and publicly funded agricultural businesses.

In the WAW framework the top-down component is further developed at the national level to identify sub-types, usually using a data-driven approach. Case studies in France, Madagascar, Malawi, Nicaragua and Vietnam tested the proposed typology (Even *et al.*, 2014). Country typology results were not directly comparable because indicators for the classificatory principles were not uniformly available and a variety of statistical methods based in national datasets were used to identify and analyse national types. But it was evident that the resulting types were policy-relevant and, with adjustment, potentially comparable.

The main recommendations of the exercise included further harmonization with regard to the selection of indicators and thresholds for the classificatory principles, development of steps to identify sub-types at the national level, further methodological refinement, particularly to combine top-down and bottom-up approaches, and procedures to enrich the descriptive analysis of types. Even *et al.* (2014) provided a synthesis of potential international types that included asset endowment and on-farm specialization or diversification (see Table 9).

---

<sup>24</sup> A planting pool – *pool de siembra* – is the name given in Argentina to a system of agricultural production characterized by the leading role played by financial capital and the organization of a transitional enterprise system that takes control of agricultural production by leasing large tracts of land and hiring equipment for planting, spraying, harvesting and transport with a view to generating economies of scale and high yields.

**Table 9. WAW tentative international typology (under discussion)**

Holding sector/data source	Type 1: Marginal holding	Type 2: Multi-active holding	Type 3: Subsistence family farm with diversified livelihood	Type 4: "Pure family" commercial farm with limited input and assets	Type 5: Commercial family farm with little hired work and minimum capital	Type 6: "Family business" farm with limited market involvement	Type 7: "Family business" farm with strong commercial orientation	Type 8: Family business "with manager", mainly commercial	Type 9: Corporate firms, subdivided according to legal status:
Distinguishing criteria	Family-managed holding with no hired labour, subsistence strategies" including sale of labour	Family-managed holding not specialized in agriculture, limited hired labour, may include "recreational" holdings		Peasant					Planting pool, cooperative farm, agricultural business or publicly funded agricultural holding.
Sector/data	Usually excluded from census because not considered agriculturally specialized holdings or households		Included in censuses and agricultural household surveys						In censuses but not household surveys
Legal status	Mostly informal household-managed holdings		Household-managed holdings; formal or informal			Household-managed holding; formal	Enterprise or professional holding	Corporate	
Management			By the family, directly by the owner				Hired manager; possibly non-family investors	Hired manager	
Family or hired labour	Family labour only	Family labour, with some temporary hired labour	Family labour with limited hired labour	Family labour only	Family labour with limited hired labour: no permanent worker; temporary labour and contract services <50% of labour force	Family labour with various hired labour but <50% of total labour force	Family labour with various hired labour but <50% of total labour force	>50% hired Limited family input but family owns most of the capital; absentee land owners etc.	No family labour.

Production/sales	Mainly subsistence, limited diversification and cash crop	Minimum sales/production/cash crop; more local; may include other variance costs			Mixed market involvement	Clearly commercial, possibly export-oriented		
Off farm diversification and on-farm specialization	Little on-farm or off-farm income; casual agricultural wages, landless coping strategy	Not specialized in agriculture but with stable job or activities outside agriculture	Stable off-farm activities but with viable agricultural activities	Specialized in agriculture as main occupation, with limited off-farm activities	Specialized in agriculture as main occupation	Stable off-farm activities but with viable agricultural activities	Specialized in agriculture as main occupation	Holding specialized in agriculture, but owner may have off-farm activities
Asset	Very limited assets, including "landless"	Limited assets	Minimal assets	Minimal assets	Can be well capitalized	Mixed capital	Capitalized, potentially increasingly	

### **2.3.5. Historical overview: global agricultural typology by the International Geographical Union**

Most of the literature reviewed so far is recent, but earlier work on establishing a global agricultural typology also offers valuable lessons. One of the earliest projects (Kostrowicki, 1970 and 1979) was organized by the IGU, which in 1964 established a commission with the following objectives:

- i. to establish the principles, criteria, methods and techniques of agricultural typology;
- ii. to initiate, promote and coordinate regional studies aiming at the identification of agricultural types of various orders on the basis of criteria and methods recommended by the Commission; and
- iii. to work out the typological and regional classifications of world agriculture.

These objectives were based on the need to establish shared foundations for typology building – clearly defined methods, uniform principles, comparable criteria and measurement techniques. The agricultural typology was intended to:

- i. improve understanding of natural resources and other conditions of agricultural development by various forms of agriculture, and their future possibilities;
- ii. assess more fully the agricultural properties impeding the development of individual forms of agriculture and of the other properties that accelerate such development; and
- iii. develop a better definition of directions for further development through the transformation of the present forms of agriculture into other more effective ones.

The “agricultural holding” as defined by FAO at the time was chosen as the basic unit for the agricultural typology. Another interesting feature was the recognition of a continuum between individual holdings at the lowest level and international types of agriculture at the highest level, with several levels of types and sub-types. It was recognized that although the identification of types of agriculture should be based on the same general principles and criteria, the differences in the lower hierarchy required the definition of more detailed differences, which in turn meant using more indices and more detailed techniques. On the other hand, the higher the hierarchy the fewer and more general the indices and measures applied in agricultural typology (Kostrowicki,

1970, 1979). This idea was included in the WAW international typology, which recognized international types at one extreme and national sub-types that could be further refined at the other; this was highlighted by Emtage *et al.* (2006), who saw the policy relevance and usefulness of linking national typologies with local typologies.

The IGU typology studies also recognized that the incompleteness data in some countries meant that some typological studies had to be based on estimates rather than statistical data. Even in developed countries agricultural statistics did not necessarily provide all the items required for a sound agricultural typology and, even when available, were seldom fully accurate. This led to the conclusion that the most accurate methods and techniques should always be used, but that the results obtained were only approximate and the conclusions drawn could be more precise than the material used. Another conclusion, which offers lessons for today, was not to avoid the use of assessments and estimates based on information other than statistical data. Although the amount statistical information have increased and there are international frameworks for coordinating data collection, there is still room for improvement with regard to the integration of different data sources; administrative data is an example.

To maintain comparability of results, it was decided that agricultural typology should be based on identical agricultural attributes, irrespective of scale, time and place, and that the same methods and techniques of type identification should be applied (Kostrowicki, 1989). In the light of experience, it was decided that the typology of agriculture should be based on the following four groups of agricultural attributes:

- i. social, including land tenure and size of operation;
- ii. operational, covering the most important inputs in agriculture;
- iii. production, including agricultural productivity, commercialization and specialization; and
- iv. structural, showing the proportions between various branches of agriculture.

To balance individual groups and minimize the number of variables, it was agreed that each group would be represented by an average of seven variables (Box 7).

**Box 7. Inherent attributes to define the 1964 IGU international agricultural typology**

**A. Social attributes**

1. Percentage of total agricultural land held in common – arable land, including fallow + perennial crop + permanent grassland.
2. Percentage of total agricultural land under labour and share tenancy/share cropping.
3. Percentage of total agricultural land owned by private persons, irrespective of land-tenure system.
4. Percentage of total agricultural land operated by the collective or state enterprise.
5. Number of people employed in agriculture on each agricultural holding.
6. Area of agricultural land (ha) on each agricultural holding.
7. Gross agricultural production in conventional units (see appendix) for each agricultural holding.

**B. Operational attributes**

8. Number of people employed in agriculture per 100 ha of agricultural land.
9. Number of draught animals – horses, mules, donkeys, oxen and buffaloes used in agricultural work – in conventional draught units (see appendix) per 100 ha of cultivated land – arable land excluding fallow + perennial crops + cultivated grassland and uncultivated meadows and pasture.
10. Number and horsepower of tractors and other self-propelling machinery per 100 ha of cultivated land.
11. Amount of chemical fertilizer in pure form – nitrogen, phosphorus and potassium – per 1 ha of cultivated land.
12. Percentage of total cultivated land under irrigation.
13. Percentage of total arable land harvested, including fallow.
14. Number of farm animals in conventional animal units (see appendix) per 100 ha of agricultural land.

**C. Production attributes**

15. Gross agricultural production in conventional units per 1 ha of agricultural land.
16. Gross agricultural production in conventional units per 1 ha of cultivated land.
17. Gross agricultural production in conventional units per person employed in agriculture.
18. Commercial (delivered off-farm) agricultural production in conventional units per person employed in agriculture.
19. Percentage of commercial agricultural production in gross agricultural production.
20. Commercial agricultural production in conventional units per 1 ha of agricultural land.
21. Degree of specialization in commercial agricultural production.

**D. Structural attributes**

22. Percentage of total agricultural land under perennials – trees, shrubs and vines – and semi-perennials – e.g. hops, cotton and sugar cane – that cover land without rotation for several years.
23. Percentage of total agricultural land that is permanent grassland, including leys in field-grass systems and current fallow if used for grazing.
24. Percentage of total agricultural land under food crops – grains, tubers, roots and bulbs, vegetables and fruit.
25. Percentage of animal products in gross agricultural production.
26. Percentage of animal products in commercial agricultural production.

27. Percentage of industrial crops – e.g. fibre, oil, sugar and tobacco – in gross agricultural production.

Source: Kostrowicki (1982)

The identifying variables in Box 7, which constitute the deductive process of the IGU agricultural typology, were developed in consultation with 50 agricultural geography experts. The variable values for every unit studied were transformed into 28-digit codes representing global ranges (see Annex 1 for details). Box 8 presents the types were identified in the IGU agricultural typology.

**Box 8. Examples of types developed in the 1964 IGU agricultural typology for the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> orders**

**T – Traditional intensive agriculture**

*Ti* – traditional small-scale labour-intensive crop agriculture

*Tiu* – irrigated medium-production semi-subsistence to semi-commercial crop agriculture; transitional between *Ti* and *Tm*; found in parts of Macedonia as a relic of older traditional labour-intensive agriculture

*Tm* – traditional small-scale mixed agriculture

*Tmr* (formerly *Tir*) – labour-intensive low-production partly irrigated semi-subsistence mixed agriculture, with some livestock breeding; transitional between *T*, *E*, *Ti* and *Tm*; also in Macedonia.

*Tme* (new) – transitional small-scale low-production semi-subsistence mixed agriculture; described by W. Tyszkiewicz on the basis of information from Macedonia.

*Tmm* – semi-subsistence to semi-commercial mixed agriculture; found in Poland and parts of Yugoslavia.

*Tmj* (new) – traditional small-scale labour-intensive low-production semi-subsistence mixed agriculture, mainly crop growing.

*Tmk* (new) – traditional labour-intensive medium-production semi-subsistence mixed agriculture, mainly livestock breeding; mainly in southern Poland, mountainous areas of Romania and Yugoslavia.

*Tmo* (new) – traditional medium-intensive medium-production subsistence mixed agriculture, mainly livestock breeding; in Poland and, mainly part-time.

*Tma* (formerly *Mmt*) – medium-scale semi-commercial mixed agriculture, mainly livestock breeding, transitional between *Tm* and *Mm*; mainly in mountainous areas of Austria, Finland, Norway, Poland, Romania and [Yugoslavia] and the French *Massif Central*.

**M – Market oriented agriculture**

*Mm* – small-scale mixed agriculture

*Mmm* – small-scale mixed agriculture; mainly north-eastern Austria, central Belgium, southern Finland, north-eastern France, central German Federal Republic, parts of northern

Italy, southern Norway and western Poland.

*Mmz* (new) – market-oriented small-scale medium-production mixed agriculture, mainly livestock breeding; in Corsica, the French Alps and Sardinia.

*Mma* (revised) – market-oriented capital-intensive mixed agriculture specializing in livestock breeding; in Denmark, Finland, Great Britain, northern and southern German Federal Republic, Ireland, parts of the Netherlands, Normandy and parts of Norway.

*Mme* – small-scale mixed agriculture, mainly crop growing; in parts of Italy.

*Mmr* (new) – market-oriented capital-intensive mixed agriculture, mainly crop growing; in central, eastern and south-western France and parts of Italy.

*Mmm* – small-scale mixed agriculture, mainly industrial cropping; in parts of Italy and Austria.

*Mmi* (new) – market-oriented, highly capital-intensive, productive and commercial; mixed agriculture, mainly livestock breeding; in northern Belgium, Lombardy and the Netherlands.

*Mmf* (new) – market-oriented small-scale medium-intensive mixed agriculture, mainly crop growing and including a high proportion of perennial crops; in central and southern Italy, the Italian Riviera and Provence.

*Mi* – small-scale intensive agriculture.

*Mim* (new) – market-oriented small-scale capital-intensive agriculture specialized in perennial crops; in south-eastern Italy, parts of Languedoc and Provence and southern Sicily.

*Mif* – specialized fruit-tree growing, transitional between *Mi* and *Ms*; in parts of southern France and Italy.

*Ml* large-scale intensive agriculture.

*Mlm* (formerly *Mml*) – market-oriented large-scale highly productive mixed agriculture; in the Paris basin and western France.

*Mlc* – large scale irrigated mixed-crop agriculture; in the Paris basin.

#### **A – Highly specialized livestock breeding**

*Ar* – extensive commercial herding.

*Arr* – market-oriented livestock grazing; large-scale low-production commercial reindeer breeding; in northern Finland.

*Aro* – socialized livestock breeding; no code available; in northern USSR.

#### **S – Socialized agriculture**

*Se* – incipient mixed non-intensive socialized agriculture.

*Sem* – incipient mixed agriculture; in parts of Bulgaria, Romania and the USSR.

*Sec* – incipient mixed agriculture, mainly crop growing prevalent; in parts of Romania and the USSR.

*Sm* – socialized mixed agriculture.

*Smm* – mixed agriculture; in parts of Bulgaria, Byelorussian SSR, Czechoslovakia, Estonian SSR, the German Democratic Republic, Hungary, Lithuanian SSR, Poland, Romania, Ukrainian SSR and Yugoslavia.

*Sma* (new) – socialized very large-scale medium-intensive low-production mixed agriculture,

	mainly livestock breeding prevalent; in northern areas of European USSR.
<i>Smd</i> (new) – socialized large-scale highly capital-intensive and productive mixed agriculture, mainly livestock breeding; in most of the German Democratic Republic and parts of Czechoslovakia, Hungary and Poland.	
<i>Smc</i> – mixed agriculture, mainly crop growing; in Bulgaria, parts of Rumania, parts of the Ukrainian and Moldavian SSR, parts of the middle Volga and north Caucasus regions.	
<i>Smu</i> (new) – socialized very large-scale highly capital-intensive and productive mixed agriculture, mainly crop growing; in most of the Ukraine, the Don and Kuban regions and parts of Bulgaria and Romania.	
<i>Smi</i> – capital-intensive irrigated mixed agriculture; in parts of eastern Rumania.	
<i>Sme</i> (revised) – extensive livestock breeding with subsidiary crop growing; in Caspian sea coast, the Daghestan and Kalmyk autonomous republics and Astrakhan and Chelyabinsk provinces.	
<i>Smj</i> (new) – socialized large-scale very low-labour and highly capital-intensive mixed agriculture, mainly livestock breeding; in Macedonia.	
<i>Sg</i> (new) – socialized intensive medium-production dual-purpose agriculture.	
<i>Sgt</i> (new) – socialized very large-scale agriculture, mainly intensive crop growing and livestock breeding; in southern mountains of Bulgaria and the Armenian SSR.	
<i>Sn</i> – socialized horticulture.	
<i>Snj</i> (new) – medium-production socialized horticulture, specializing in fruit and vegetable production; in parts of the Crimea and southern Macedonia.	
<i>Sc</i> – extensive specialized grain-crop agriculture; in south-eastern European USSR.	
<i>Se</i> – specialized industrial crop agriculture.	
<i>Ssc</i> (new) – socialized very large-scale capital-intensive, medium to high production agriculture specializing in industrial and fruit crops; in Georgian and Azerbaijan SSR.	

Source: Kostrowicki (1989)

### 2.3.6. Summary: global agricultural typologies and definitions of family farms

A major lesson arising from the various global agricultural typologies is that the construction approaches and methods used are rarely identified explicitly. But clear definition is essential if typologies are to be replicated and used effectively in analysis of transformations and monitoring systems. Another lesson is that international comparability can best be enhanced with a mix of deductive methods for preliminary selection of classificatory principles and international types and data-driven approaches for refinement at the national level. It must be emphasized that few frameworks aim to connect the global, national and local levels in a single continuum; the WAW framework is an exception.

It is also important that the unit to be typified is not always the agricultural holding: other wide-ranging concepts such as “farming systems”, “strategies”,

“rural worlds” or “scenarios” may be typified. The diversity of units of analysis and their identifying criteria as used in the typological exercises reviewed are summarized in Table 10.

Family farms and their identifying characteristics are not always included in the formulation of the typological framework, and as a result are not explicitly separated from other farm types; again, the WAW and CIRAD frameworks are exceptions. This is sometimes because the focus is not the agricultural holding and sometimes because the typology focuses solely on family farms, in which case they cannot be evaluated against other forms of agricultural holding. Further integration of definitions of family farms is desirable in consolidating an international framework of agricultural holdings. Recent definitions of family farms described in REAF-Mercosur (2010), IWG FF (2014) and FAO (2014) can usefully be reviewed at this stage.

**Table 10. Main identifying criteria used in global agricultural typology exercises**

Identifying criteria*/event typified	Context			Production system			Assets and management		Size and orientation			
	Agro-ecology	Socio-economic context	Type of country – agriculture-based, transformed etc.	Location – urban, rural, coastal	Intensity of production	Type of farm production system	On-farm and off-farm activity	Management	Labour usage	Farm assets	Income poverty	Commercialization
<b>Farming systems</b>												
Dixon <i>et al.</i> (2001)	X			X	X	X				X		X
Cassman <i>et al.</i> (2005)	X				X	X						
Hazell and Wood (2008)		X		X								
Seré and Steinfield (1996)	X				X	X				X		
IIASA/IFAD (2014)	x				x						x	
<b>Strategies, development pathways, rural settings</b>												
World Bank (2007)							X					
OECD (2006)										X	X	X
HLPE (2013)		X								X		
Fan <i>et al.</i> (2013)	X	X	X							X		
AGRICULTURAL HOLDING / FAMILY FARMS												
Pingali and Rosegrant (1995)												X
FAO (2014a)										X		X
Brooks <i>et al.</i> (2008, 2011)										X		X X
Saravia Matus <i>et al.</i> (2013a) Even and Saravia Matus (2014)					(X)	(X)	X	X				X
CIRAD (2013)										X		
IGU (Kostrowicki, 1964)						X		X	X			X

Source: Adapted from IIASA/IFAD (2014).

X denotes that the information source can identify the related international type.

(X) denotes exceptions to such data collection/participation processes.

In REAF (2010), for example, family farming is not driven strictly by profit so much as by production; this reflects the view of Chayanov (1966). Family farming therefore involves a lifestyle where economic returns are conditioned by other factors such as community dynamics, family traditions, moral values, relationship with the environment and risk minimization. There is a sense of market autonomy with regard to inputs and outputs, and limited use of paid labour even though labour-exchange systems are in place. The “unit of family production” is the dwelling, which is also their place of work. On this basis the *Guidelines for the Recognition and Identification of Family Farming in Mercosur* establish three points that define the AF in the region: i) predominantly family labour, with limited hired labour; ii) the family is directly responsible for production and the management of agricultural activities and resides on the premises or nearby; and iii) productive resources such as land and capital are compatible with the working capacity of the family.

The recently published FAO-ESA working paper highlights similar parameters for defining family farmers. In their view, family farming is undertaken by producers who, although highly diverse, have the following characteristics (FAO, 2012): i) predominantly family labour is used, with the head of the household participating directly in the production process, so even when there is some division of labour the head of the household is both manager and worker; ii) agriculture, forestry, aquaculture or fishery is the main source of family income and may be complemented with non-farming activities on or off the premises such as tourism, environmental benefits, small-scale production, small agribusiness or casual work; and iii) access to land and capital resources is limited.

This definition of family farm would not be in line with the identification of family farms as conducted under USDA typologies (2013) which include large family farms that have access to substantial land and capital resources. Likewise, this definition would also set itself apart from the conceptualizations included in the RIMISP/IFAD report (2014) which are aligned to the REAF definition and include family farmers not necessarily specialized in agriculture.

In Ramos (2014) the definition adopted by IWG FF is: “A family farm is an agricultural holding which is managed and operated by a household and where farm labour is largely supplied by the household... The household is the family unit to which the holder belongs and in which the householder’s family members share the same living accommodation, pool some or all of their income and wealth and consume certain types of goods and services collectively, mainly housing and food.” This definition is acknowledged as a

multi-dimensional construction that recognizes the following identifying criteria: i) family labour, with occasional hiring of wage labour; ii) manager – who makes decisions related to production, technology and commerce; and iii) situation – autonomous or dependent with respect to markets for inputs, factors and products.

These identification criteria are closer to the proposals of the WAW international typology, and less restrictive than the definition introduced by Garner and Campos (2014) in the sense that agricultural activities as the main source of income is not a prerequisite for definition and consequent exclusion of certain farm households or rural agents from the typology. The IWF FF identifying criteria are also aligned with the REAF-Mercosur definition and include holdings that are not necessarily dependent on agriculture as the main livelihood. The IWG proposed an overall theoretical typology of family farming, however, which added other characteristics to the three criteria above (see Table 10) to give the following theoretical types:

1. Family farming with market-oriented production, easy access to markets and production factors; capitalized, associated with social and family farming organizations and other family farms that provide services or operate as cooperatives. The family organizes the work on the farm, hires temporary labourers and contracts services such as ploughing. Revenues come mainly from on-farm production. The family is above the poverty line and can be competitive in international markets.
2. Semi-capitalized family farming with limited access to markets such as financial institutions and production factors, mainly land access and land tenure, but access to local markets; preliminary or weak status of association in local organizations. The family organizes and decides on farm work, business operations and production. Usually above the poverty line, but sometimes with insufficient income to purchase goods and services. A large share of the family's food is obtained from the farm, though they usually sell their surpluses in the market or arrange a line of credit with the market.
3. Subsistence family farming that encounters difficulties with regard to access to land or tenure; no capital, and generally unable to obtain financial credit; low or zero level of association, and below the poverty line. Production is for self-consumption. The family makes decisions, but on-farm labour is typically precarious. Family members, particularly the head of the family, sell their labour off-farm to earn income for the

purchase of essential services; they sometimes exchange their surplus production for local products. They may receive assistance from the state under social and production-promotion policies.

4. Subsistence family farming that fails to provide for basic needs; tenure of land is irregular; they sell their labour off-farm, and receive state help under social and production-promotion policies. Family work is partly off-farm and partly on-farm. Below the poverty line.
5. Rural wage earners who are also family farmers, with informal and irregular access to and tenure of land.
6. Forms of shared use of land in partnership: labour and production cooperatives, and community work on state-owned land.
7. Indigenous and ethnic communities, shepherds, nomadic shepherds and gatherers; shared use of land in partnership.

Table 11 sets out the criteria used in the definitions of family farms discussed so far.

**Table11. Main identifying criteria used in selected definitions of family farms**

Main identifying criteria	REA F	FAO- ESA	IWG- FF
Family labour usage	X	X	X
Family head directly involved in farm work		X	
Agriculture is the main source of family income		X	
Family-level management	X	X	X
Productive resources compatible with working capacity; usually limited	X	X	
Relationship with markets – autonomy or dependency			X

In producing an international typology that is relevant to policy dialogue on family farming, it is useful to review the definitions used at the regional and international levels and their classificatory principles, and when possible to use them to identify types and in related data frameworks. In this respect, the WAW international framework is open to the inclusion of criteria for defining family farms – labour usage, legal status, management style, output orientation and the extent of commercialization or subsistence – and to the use of the agricultural holding as the main unit of analysis in the consolidation of its international types.

## 2.4. Capturing transformation and ensuring comparability using a typology-based tool

In the light of the national, regional and global typologies reviewed this section considers the challenges associated with capturing transformations at the agricultural holding level through a typological exercise.

Alvarez *et al.* (2014) stress that typologies based on one-time measurements give a snapshot of farm situations at a particular time (Kostrowicki, 1977) and that farm dynamics will rapidly render such typologies obsolete; regular updates are needed to keep them relevant (Landais, 1998; Valbuena *et al.*, 2014). The literature review in Saravia Matus *et al.* (2013a) showed that very country-level or regional-level typological exercises were continuously evaluated and updated to reflect transformations at the agricultural holding level. Alvarez *et al.* (2014) highlighted studies and approaches that took farm dynamics into account:

- The movements of individual farms can be projected into trajectories of farm types, which have been hypothesized as predictable in conformity with general trends (Laurent *et al.*, 1999; Tittonell, 2014). It must be borne in mind, however, that individual farms might choose or be forced to follow different pathways (Valbuena *et al.*, 2014). In these studies a deductive approach was used to define future trajectories in advance and investigate the nature of the transformations.
- Falconnier *et al.* (2015) conducted a multivariate analysis of the current situation, analysed the use of land for crops and hence constructed a decision-tree for farm classification. The decision-tree and some variables from farm data from previous years were used to classify and compare the farms with the current classification scheme. The decision-tree was defined in advance, and selected variables were used to position farms on the pathways. The analysis of transformation worked from past to current scenarios.
- Stakeholders and experts can assist the capture of some farm dynamics because they can evaluate farm types in the light of long-term trends. Their expertise can help to trace the evolution of farms and hence explain actual farm structures and the resulting farm types. The approach is a mixture of the previous two cases: trajectories are deduced from past scenarios and deductive participatory methods are used to derive the information required.

- For purposes of prioritization and comparisons between areas, household types that are below the poverty line can be identified (Davis *et al.*, 1997; Howe and McKay, 2007; Tittonell *et al.*, 2010). Identifying household types trapped in poverty can indicate their likelihood or otherwise of escaping from poverty (Howe and McKay, 2007); the analysis in this case was based on households' ability to escape poverty eventually.
- Flows of resources such as food, labour, money and knowledge and inter-dependency between household types in a community constitute another indicator of the potential for change. Laurent *et al.* (1999) present a flow diagram of resources moving between household types that helps to elucidate the situation; they use a broader selection of variables for analysis with a view to understanding how particular types evolve in terms of access to assets and inputs.

It can be argued that in these exercises the framework is set so that the identified types at a particular point in time are maintained with a view to studying the ways in which they have changed or will change. The possibilities that the types may have evolved into other types, or that new types have emerged, are not considered; this would, of course, lead to a higher level of complexity. These studies do provide a reliable starting point for analysis, even though it is evident that different variables are used in each case to explain the transformations of agricultural holdings. To enforce replicability in a dynamic typological study, the same group of variables should be used for specific tasks such as identification, description and trajectories of types.

In another example, the country-level typological exercise in Mali based on dynamic analysis experienced some of the limitations referred to above. In their 2013 study, Ouedraogo and Nayo assessed the stability of typology findings through analysis of Markov chains, whereby different “states” in which the population of farms could be typified were defined. Taking the movement of individual farms from one state to another over time to be a stochastic process, the probabilities of such movements could be estimated because the Markov chains analyse the stability of membership through conditional probability – estimating the probability of a given holding passing to another type knowing that previously it belonged to a different type. This made it possible to detect groups of stable types and identifying variables, and to assess their ability to remain together as a group through their transition probability. In this case the movements were across types but not to new types, but even so the findings and

methods could be useful for country-level or local-level assessments in which types can be identified or corroborated by experts.

In the IGU initiative, the type of agriculture was understood as a dynamic concept that evolved or transformed in accordance with changes in its basic characteristics. With regard to the classification of the basic characteristics that defined the agricultural types, it was recognized that their inherent characteristics or properties could be used. The remaining external characteristics, or the conditions in which agriculture had developed, were important in explaining why a particular type of agriculture developed at a particular time and place. These external issues, in other words, were not relevant in identifying the types of agriculture so much as their evolution or current situation. The external characteristics include factors such as soil fertility, water availability, climatic conditions, land form, access to transport, markets and processing facilities for agricultural goods, market conditions, world prices, government policies on subsidies and tariffs, and laws and regulations. Kostrowicki (1964) expressed astonishment at the frequency with which these conditions were confused with the identifying or inherent characteristics of the objects classified. In agricultural typology, such confusion leads to a subjective approach in identifying the agricultural types because more importance is ascribed to some external conditions than to properties inherent in agriculture itself (Kostrowicki 1970, 1979).

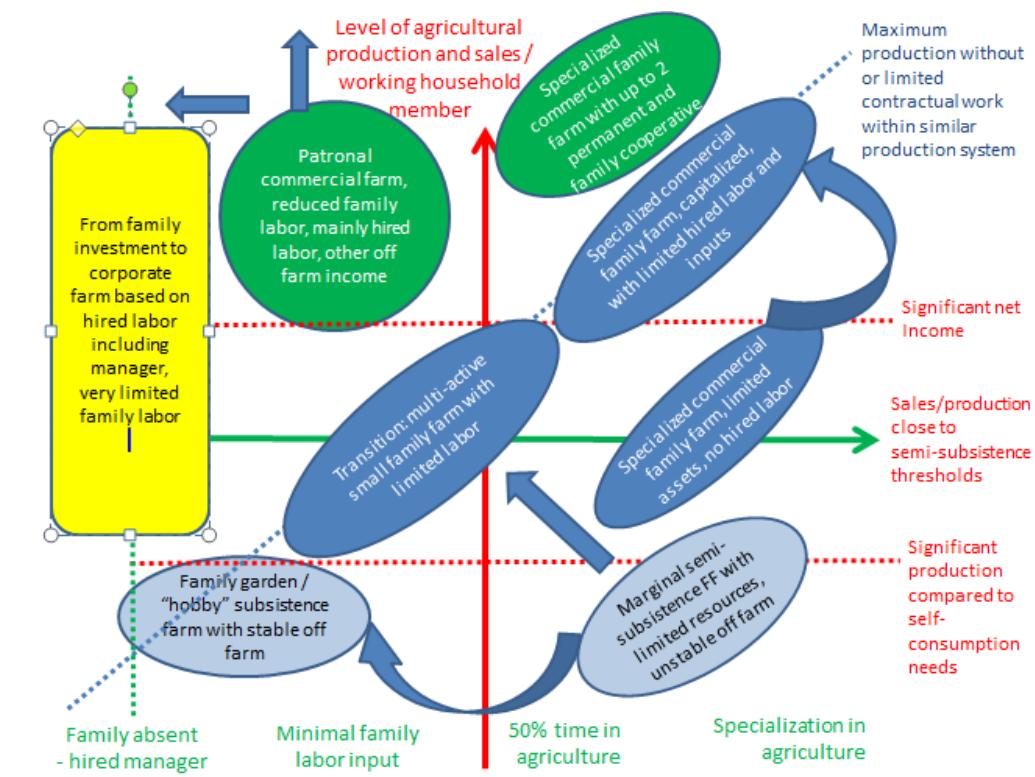
At the local and national levels, typology findings can be used to hypothesize farm trajectories from past to present scenarios or from present to future scenarios. Forecasting at the global level is a far more complex task (see Box 9). In the macro-context, simulations and hypotheses are established to mark major development pathways or trajectories, and region-specific or country-specific assumptions and scenarios may be established to fine-tune the analysis. Sometimes transformations are captured at the farming system level, which makes it possible to identify major transitions from one farming system to another. The macro-approach, which may focus on identifying development pathways or transitions from one farming system to another, is related to the fact that typologies are static devices. Hence the question is: how should typologies be built in order to capture changes and transformations in farm types at the international level?

In the WAW proposal of types (see sub-section 2.2.3), assumptions are made in terms of the potential evolution of family farm types in terms of labour usage, access to markets and productive assets: i) if access to productive assets and off-farm job opportunities are improved for marginal farms, such farms can be

assumed to transition to multi-active farms; ii) if family labour focuses on off-farm activities, subsistence farm households may become specialized in off-farm activities; iii) if marginal farms progressively increase their asset base in terms of land, capital and inputs such as hired labour, their production levels and market involvement increase and they shift towards commercial farming.

Increased hired labour indicates the evolution of the remaining family farm types beyond the limits of family labour. In the case of family business farms, the transformations are indicated by improved access to capital; if shareholders are involved, family business farms may even transition into corporate farms. In other words, the selected types in the framework are devised so that they evolve and fit into other types as the distinguishing variables change. This deductive approach can be used to simulate trajectories among established types previously identified through theoretical assumptions based on current rural transformation trends such as specialization and mechanization.

**Figure 2. WAW Theoretical assumptions about type transformations**



If the typology is built using a data-driven approach, the new dataset may indicate that new identifying criteria are needed to update it; this will in turn lead to a different set of types, which will ultimately impede direct comparison between the old and the new typology and monitoring objectives. But if a deductive approach is used and types are defined in advance, it will be difficult to determine whether a new type of farming characterized by different identifying criteria has emerged. The new and the typologies would be comparable if a deductive approach is used, but the capture of transformations would be based only on the previous structure, which would conceal the appearance of new agricultural holding structures.

This would also apply to some extent if a combined approach starting with a deductive part and ending with a data-driven approach were used. The monitoring effectiveness of the typology in a deductive approach or even a combined approach ultimately depends on the similarity of farm structures or their sustainability over time; this would be a sound assumption in an international setting. There is a need for assessment in greater depth of monitoring systems that rely on typology-based tools and focus on analysis at the farm-type level. It is clear from other global typologies that the development of regional or country-based development pathways is required to establish an effective monitoring system at larger scales.

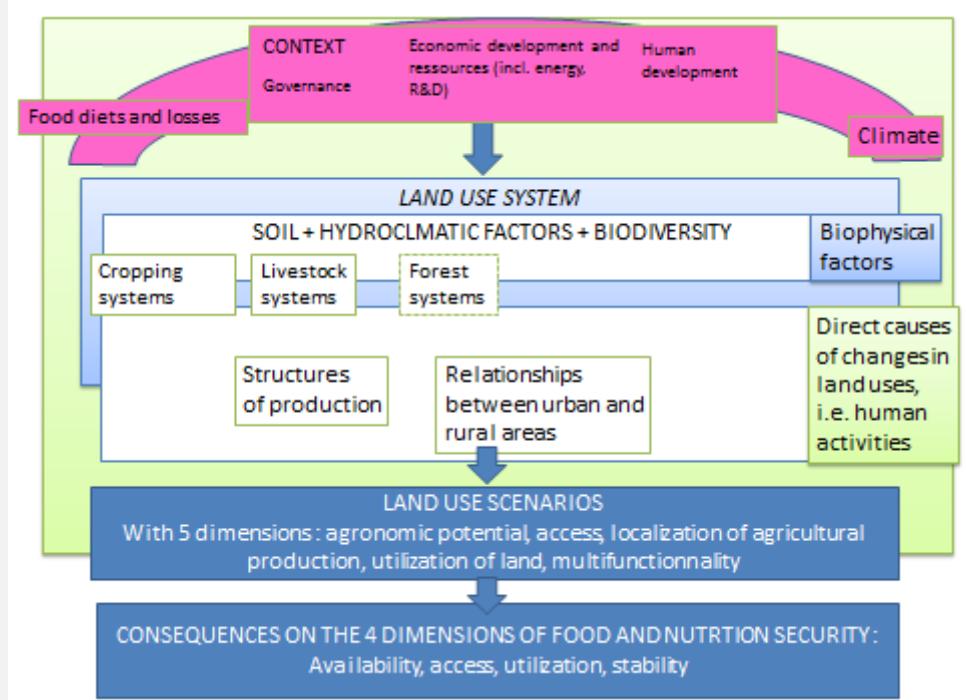
#### **Box 9. The Agrimonde-Terra project**

Agrimonde phase 1 highlighted the complex interactions between food security and insecurity, land and its uses, and human effects on the environment. There have been many studies of “land use” and “food security”, but their relationship is not often analysed. Until recently, land planning and land uses were not considered as determining factors in food insecurity at the global level.

Agrimonde-Terra researchers believe that at the global level and even at the regional level, the strategies for ensuring food security will depend on the availability of arable land, access to land for food production, levels of fertility and sustainable development. Drawing on science, experience and evidence from research and development organizations, the project focuses on:

- likely challenges to land use and food security until 2050, with a review in 2025;
- emerging regional trends and innovations in the agricultural, agro-industrial, environmental and social sectors that may influence land use and food security;
- combining regional and global approaches, and linking them with trade;
- combining a quantitative modelling approach a qualitative approach involving narrative and scenario building;
- food security and food insecurity, and the global food system in general;
- facilitating dialogue between researchers in CIRAD and the *Institut national de la recherche agronomique* on land use and food security, and involving participants from a range of disciplines and institutions.

Agrimonde-Terra has devised methods for building and developing scenarios connecting the global, national and local levels. The system consists of seven components, each of which has several variables.



During workshops, hypotheses were developed for each variable with a view to exploring the broadest possible range of potential futures. By combining these hypotheses, a micro-scenario can be developed for any component that describes a range of potential changes.

Causes	Components	Variables	Micro-scenario
Indirect causes of changes in land use	Context	Governance: geopolitical, institutional; stakeholders; trade agreements	Contextual
		Economic development and focus on resources: economics and politics, energy, science and innovation	
		Human development: demography, education, health	
	Climate	Rising temperatures	Climatic
		Rainfall, climate	
		Effects of biochemical cycles on agriculture	
		Societies' capacity to adapt	
		Effects on agriculture	
	Diets	Changes in foods and consumption	Diet
		Over-nutrition and under-nutrition	

		Value chains	
		Government policies	
		Effects on agriculture	
	Urban-rural relationships	Urban dynamics	Urban-rural
		Rural dynamics	
Direct causes of changes in land use	Structures	Sources of decision-making	Structure
		Distribution of production factors	
		Organization of work	
		Securing rights governing land use	
		Sources of income	
		Distance between producers and consumers	
		Rationale for land use	
	Crop systems	General orientation of system: rotations, successions, eco-system services	Crop system
		Pest and disease control	
		Fertilizer use	
		Irrigation – use of treated waste water	
		Soil tillage	
		Production and yield	
		Environmental effects	
		Agricultural and environmental policies	
	Livestock systems	Connection with land	Livestock system
		Animal feed	
		Breeds	
		Animal health	
		Production objectives	
		Diversity of livestock	
		Livestock policies	
		Synergy between crops and livestock	

The main challenge in combining micro-scenarios to form generic scenarios is specifying the possibilities for combination such as links of causality, interactions, possible interlinking. The potential relationships between micro-scenarios for direct components are examined in pairs. To combine micro-scenarios of three or more components, global contextual dynamics are used to provide a reference framework for considering the links: which plausible relationships might make it possible to combine the micro-scenarios that have already been formulated into a single scenario? How can some micro-scenarios of indirect components such as context, climate, diet and food losses stabilize interactions between direct components: what process is involved, what support do they provide? How do some micro-scenarios of indirect components limit or destabilize the potential interactions between direct components and hence orient the trajectories of the “land use” system?

Generic scenarios may be applied in two ways: to build scenarios for a country or region, and to build regionalized global scenarios. The starting point is the set of micro-scenarios, by component: a group of diverse stakeholders such as farmers, economic and political decision-makers, elected representatives, administrative bodies or researchers comes together to discuss the development of country-specific micro-scenarios and land-use scenarios. This process reveals country-specific challenges and leads to discussion among stakeholders with different experience and objectives. Such work can be conducted at the national, country or regional level. Bibliographic research is essential to provide a basis for an agreed diagnosis of past and present trends and rapid adaptation to local situations. The approach is forward-looking in that possible futures are anticipated.

There are eight stages:

1. Sharing diagnoses of the five dimensions of land use in-country in 2015.
2. Sharing diagnoses of trends and the uncertainties affecting the main components.
3. Agreeing hypotheses affecting the variables for each component in the Agrimonde-Terra conceptual framework; these can be adapted to national or regional situations as hypotheses that do not seem feasible are withdrawn and others suggested, variables are added to some components or new components are proposed with a view to building micro-scenarios adapted to the situation concerned.
4. Discussing the building of country scenarios based on micro-scenarios developed during stage 3 by identifying catalysts and observing interactions between components.
5. Adopting quantitative illustrations using the GlobAgri tool.
6. Discussing the effects of each scenario on the five land-use dimensions to arrive at possible land uses in 2050.
7. Discussing the effects of each land-use scenario on the four dimensions of food security proposed by FAO.
8. Discussing with other national stakeholders ways of achieving changes in land use.

Source: <https://www.agrimonde.org/>

Ultimately, the connection between typological work and structural transformations lies in the “farm structures” sub-component. This identifies the criteria considered to be markers of transformations, which also relate to most of the classification principles used in the typological exercises reviewed, particularly:

- the source of decision-making, which relates to type of management and status as a household or as a non-household legal entity with shareholders, a joint holding or a cooperative;
- the organization of farm labour – whether family or hired labour is used, the proportions of manual work and mechanization, and the purchase of services;
- sources of income in terms of specialized activity or multiple activities in and among farm households; and
- the distance between producers and consumers, which relates to commercial orientation in that semi-subsistence households consume

and produce, and distinguishes production for local markets from production for export.

A variable for “distribution of production factors” is also proposed that concerns the ownership of land, labour and capital and distinguishes, for example, family farms that own all three factors from farms that outsource most or all of them.

Consideration of structural transformations, trends and scenarios could hence help identify distinguishing factors and characteristics in a typology of agricultural holdings. And such a typology could in turn help to refine the identification of structural transformations by showing that there are in any country different structures with different potential trajectories.

### **Main message – Section 2**

This overview of country and regional typologies shows that the purposes of typologies can vary from targeting to extension to other areas, selection of representative farms and scaling-up to support the extrapolation of impact assessments to larger scales. The overall aim of global and international typological exercises is to construct a continuum of farming systems, strategies, scenarios and agricultural holdings. Very few such exercises – the WAW framework is an exception – connect the global context to national and local contexts.

The monitoring of transformations at the global level requires further development of analytical tools sensitive to the complexities of trajectories, which may be influenced by national or regional concerns; this implies that a spatial component must be integrated into the analysis and monitoring of agricultural transformations. Other variables in the literature that are used for tracking transformations include changes in the flow of resources such as assets and knowledge.

In certain circumstances, the criteria used to define types may also be used to track transformations, particularly with regard to food security or poverty in the sphere of family farming. This calls for the introduction of classificatory principles for: i) the identification of international and national types; and ii) the definition of descriptive criteria to enhance the characterization of emerging types.

The literature suggests different paths to this objective. The IGU typology, for example, is explicit in its use of internal and external attributes for the purpose. More recent global-level typological exercises are silent with regard to ways of organizing data for identification, description or monitoring. The WAW initiative, however, attempts to establish such a categorization: in WAW (2012) labour usage was the main classificatory principle, and information emerging from the capital and livelihood framework was used to describe types; Saravia Matus *et al.* (2013a) proposed three classificatory principles at the international level, and Even and Saravia Matus (2014) considered increasing them to five. Completion of this task is essential for the development of an international agricultural typology but it must be based on policy needs and the available data, an issue explored in section 3.

# Data Sources: International Data Frameworks and Typologies

IIASA/IFAD (2014) identifies five sources of data on technical, production, socio-economic and consumption issues at the farm-household level:

- i. agricultural censuses;
- ii. national surveys;
- iii. local surveys;
- iv. LSMS; and
- v. official multi-sector statistics.

In the Saravia Matus *et al.* (2013a) literature review, the number of data sources at the farm-household level was extended from five to six because qualitative data from focus groups and field observations proved to be relevant in building farm typologies that combine a top-down and bottom-up approach and that aim to connect the international level with national and local contexts. The six sources are:

- i. agricultural censuses;
- ii. national surveys;
- iii. local surveys;
- iv. LSMS;
- v. official statistics, registers and administrative data; and
- vi. qualitative data from focus groups, or observed field data.

The advantages and disadvantages of these sources are reviewed in the context of consolidating an international framework of agricultural typology that links global and local perspectives. Work on overcoming their present limitations is largely based on the MSCD. Potential links between the typologies and the datasets are identified because typologies often provide ways of analysing and disseminating the data and opportunities for collecting additional data and creating samples.

### **3.1. Agricultural censuses**

The programme for WCA 2020 promotes the availability of internationally comparable data on agricultural structures and provides standard concepts, definitions and classifications to be used by countries (FAO, 2015). Despite this and other attempts to create a harmonized data system, however, each country has its own constraints and priorities when it comes to collecting and processing data. The design of censuses and the data they provide vary considerably among countries, and standard concepts underlying the data are often adjusted to suit national requirements (FAO, 2005; Saravia Matus *et al.*, 2013a). Because agricultural censuses are carried out every ten years or so, they are associated with aspects of agriculture that change slowly such as the organization of agricultural holdings, farm size, land use, crop areas, livestock numbers and use of machinery, with attention to data on small administrative units and detailed cross-tabulations of structural characteristics. Unlike surveys, censuses do not normally include data that change from year to year such as agricultural production or agricultural prices. The WCA 2020 aims to provide benchmarks for crop and livestock statistics and sampling frames for agricultural sample surveys, and after the 2000 round it helped to monitor progress towards global development targets, particularly the Millennium Development Goals (FAO, 2005).

The 2010 Agricultural Census round (FAO, 2005) covered agricultural censuses between 2006 and 2015 and advocated a new approach that involves conducting agricultural censuses in several modules with a view to collecting a larger set of statistical data. The core module, preferably based on complete enumeration, should cover a limited range of data that are required by national policymakers at a lower level and necessary for the construction of sample frames for the supplementary modules. One or more sample-based supplementary modules are then to be implemented to provide more detailed data. This programme also provided for the collection of data on infrastructure at the community level (FAO, 2005).

The WCA focuses on the activities of agricultural production units – households with own account agricultural activity and other entities working land or keeping livestock: hence it is not regarded as a census of rural households. The statistical unit is the agricultural holding, which encompasses holdings operated by household members and units such as corporations and government institutions. Over 100 countries participate in the program (IIASA/IFAD, 2014).

The FAO WCA 2020 guidelines, which will be used for the 2020 round of Agricultural Censuses covering the period 2016-2025) have 128 items, of which 23 are essential items, 15 are frame items and 96 are additional items. The essential items (see Box 10) are considered the minimum data set to be collected by all countries regardless of approach with a view to compiling a minimum set of national indicators for agricultural policymaking and planning; they are to be produced for small administrative units such as districts and villages or in the form of detailed cross-tabulations. These items are required for international comparisons.

**Box 10. Essential items recognized by FAO WCA 2020 (May 2015 draft)**

List of recommended ESSENTIAL items ('+' denotes new items)	
0101	Identification and location of agricultural holding
0103	Legal status of agricultural holder (Type of holder)
0104	Sex of agricultural holder
0105	Age of agricultural holder
0107	Main purpose of production of the holding
0108	Other economic activities of the household
0201	Total area of holding
0202	Area of holding according to land use types
+	0203 Area of holding according to land tenure types
+	0302 Area of land actually irrigated: fully controlled and partially controlled irrigation
0402	Area of temporary crops harvested (for each temporary crop type)
0406	Area of productive and non-productive permanent crops in compact plantations (for each permanent crop type)
0407	Number of permanent crop trees in scattered plantings(for each tree crop)
0411	Use of each type of fertilizer
0501	Type of livestock system
0502	Number of animals
+	0503 Number of female breeding animals
0601	Use of agricultural pesticides
0801	Household size by sex and age groups
+	0901 Whether working on the holding is the main activity
0902	Working time on the holding
0903	Number and working time of employees on the holding by sex
1201	Presence of aquaculture on the holding
+ new item.	

The main advantage of agricultural censuses is that they are conducted in almost all countries, and if eventually harmonized they could be a source of reliable and internationally comparable data; the WAW country case studies, for example, were based on agricultural censuses except in Viet Nam, where LSMS data were used (Saravia Matus *et al.*, 2013a). Agricultural censuses are taken to be exhaustive and representative at the national level, but not all countries follow FAO guidelines consistently and hence differences in core variables, identification of units of observation, questions and definitions limit the degree of comparability. When quality is inconsistent, “cleaning” the data for use can be time-consuming.

Typologies emerging from censuses have the shortcoming of being updated only every decade when the censuses are carried out. Because agricultural policymakers cannot rely on old data, an alternative typology was created from the annual Agricultural Resource Management Survey (ARMS) in the USA.

The ten-year interval between agricultural censuses in other countries cannot realistically be reduced for reasons of cost, even though – as the ARMS shows – frequent surveys can monitor changes in sample populations with a view to informing policymaking. Because micro-data are sensitive, access to agricultural census databases is usually limited. FAO and other agencies are therefore seeking to enhance the quality of agricultural censuses and related data management to ensure that data are sufficiently up-to-date and detailed for international comparisons. One such project is discussed below.

AGRIS – a farm-based modular multi-year survey programme – is being designed to be a cost-effective way for national statistics agencies in developing countries to accelerate the production of disaggregated data on the technical, economic, environmental and social dimensions of agricultural holdings; the data generated are intended to inform policy, improve market efficiency and support research. AGRIS is hence an invaluable data source for the design, monitoring and evaluation of agricultural and rural policies and investments, particularly in developing countries: together with an agricultural census, a versatile market information system and appropriate use of remote-sensing and administrative data, it will be the cornerstone of any comprehensive rural statistical system. It is being developed under the Global Strategy, and complements initiatives such as the World Bank LSMS-ISA with a view to scaling-up. AGRIS will be introduced in two countries in 2016; the target for 2018 is full coverage of the Global Strategy priority countries that do not have comparable survey systems (Gennari *et al.*, 2015).

AGRIS consists of a set of questions in two categories: a core section, and a rotating section. The core section focuses on themes that remain largely the same in each survey round and refer mainly to food crop production; the rotating modules focus on specific themes. The frequency of implementation varies among countries with different agricultural systems and data requirements (see Box 11).

**Box 11. AGRIS core and rotating modules**

The AGRIS core module will cover the following topics:

Roster of agricultural holdings	Production: all crops of interest	Production: all livestock of interest
0.1 Household ag. holding	1. Last agricultural campaign	4. Livestock at the date of survey
0.1.1 Household information panel (incl. GPS info.)	1.1. Area sown	4.1. Current number
0.1.2 Household characteristics	1.2. Area harvested	4.2. No. of births
0.1.3 List of household members	1.3. Irrigated area	4.3. No. of animals bought
0.1.4 Education	1.4. Area of organic farming	4.4. No. of animals sold
0.1.5 Child labour	1.5. Quantity in storage at the beginning of harvest	4.5. No. of animals slaughtered on-farm
0.1.6 Gender	1.6. Production harvested	4.6. No. of animals delivered to slaughterhouse
0.1.7 Social protection	1.7. Use of fertilizers, pesticides, herbicides	4.7. No. of animals dead from natural causes
0.2 Non-household ag. holding	1.8. Use of other inputs	4.8. Price per kg of carcass in case of sale
0.2.1 Holding information panel (incl. GPS info.)	1.9. Price per kg of row product in case of sale	4.9. Total carcass weight of slaughtered animals
0.2.2 Holding characteristics	1.10. Share used for food processing	5. Production of raw milk
	1.11 Share used for other self-consumption	6. Production of eggs
	2. Next campaign	7. Other animal productions
	2.1 Area foreseen	8. Production shocks
	3. Production shocks	

The four AGRIS rotating modules will collect data on the following topics:

<b>Rotating module 1: Economic quantities, types and amounts</b>
1. Means of production: Land tenure, ownership of livestock; storage
2. Ownership of livestock
3. Income
4. Production expenditures
5. Main commercial networks for production
6. Credit and access to financing
7. Access to information and other issues

<b>Rotating module 2: Labour force</b>
<b>1. Household members' contribution to the agricultural holding (household sector only)</b>
Basic demographics information
Participation in agricultural activities of the AH (incl. salary/wages; employment/own use production, etc.)
Participation in diversification activities of the AH (incl. salary/wages; employment/own use

production, etc.) Participation in other activities (incl. unpaid domestic activities, care, other activities related to own family AH) Managerial role in the agricultural activities on the AH
<b>2. Household members' other working activities - diversification (household sector only)</b>
<b>3. Hired labour of the AH (household and non-household sectors)</b>
Basic demographic information Participation in agricultural activities (incl. salary/wages) Participation in diversification activities of the AH (incl. salary/wages) Wages / labour cost Work conditions (incl. decent work, informality, etc.)
<b>4. Other labour force used in the AH (household and non-household sectors)</b>
Non-permanent employees (seasonal) Agricultural work carried out by a specialized company Other labour force

<b>Rotating module 3: Machinery – amount, type and ownership</b>
1. Manually operated equipment
2. Animal-powered equipment
3. Machines for general farm use
4. Tractors and other vehicles
5. Land preparation and planting machinery
6. Crop maintenance machinery
7. Crop-harvesting machinery
8. Post-harvest machinery
9. Livestock-related equipment
10. Aquaculture-related machinery
11. Energy-production machinery
12. Storage and marketing equipment
13. Water-management machinery

<b>Rotating module 4: Production: methods, quantities types and areas</b>
1. Use of natural resources
2. Crop production system and resources
3. Livestock production system and resources
4. On-farm processing of agricultural products and by-products
5. Organic farming
6. Agro-forestry
7. Adaptation to climate change and mitigation strategies
8. Access to and use of services, infrastructure and natural resources
9. Greenhouse gas emissions and environment
10. Adaptation to climate change and mitigation strategies
11. Waste management

### **3.2. National surveys**

National surveys are used as complementary instruments to update agricultural census datasets in the official typologies of high-income countries: ARMS in the United States, the Farm Financial Survey (FSS) in Canada and FADN in the EU are examples. They have the advantages of being updated annually or every two years and of providing a wide variety of data. ARMS, for example, provides information on farms as businesses, farm households and individual agricultural holdings (Johnson, 2002). For reasons of cost they involve only a representative sample of the national distribution of holdings, and are often connected to an official classification of holdings: in the EU, for example, farms sampled by FADN must reflect the common EU typology.

The definition of agricultural holding on which these surveys are based is sometimes criticized for excluding the smallest holdings or informal holdings without land titles in high-income countries, and groups such as tenant farmers in some developing countries. The Agriculture and Agri-Food Canada farm typology is based on the FFS, a biennial survey covering farms with revenues not less than CDN\$10,000, a definition that excludes subsistence or leisure holdings. In parts of the EU, FADN data exclude “non-professional farms”. Rusali (2011) stated: “... the sample of evidence (FADN) shares only a percent of the total of EU farms. Under these circumstances, it cannot be said that there is a sound assessment of the situation of agricultural holdings in the EU ...” (Saravia Matus *et al.*, 2013a).

In the IIASA/IFAD (2014) typology, which is connected with the Canadian Globim Corporation model, surveys at the national and local levels, LSMS surveys and the WCA were used to identify types of farms in Ethiopia. Other national surveys included the agricultural sample survey and the most recent population and housing censuses.

### **3.3. Local surveys**

Local research or statistical surveys are used to update or corroborate information from agricultural censuses. A common criticism of national agricultural censuses and surveys is that they provide few data on the environmental effects of agricultural holdings; this is usually overcome in local surveys conducted for particular research or development projects. Ad hoc surveys are interesting in that they can address a range of issues, but they tend to cover a small sample of agricultural holdings and are highly context-specific and hence cannot be used in the creation of typologies; they can, however, be

used in setting up in-depth local typologies that complement national typologies, as in the case of the *Réseau des Observatoires Ruraux* dataset in Madagascar (Saravia Matus *et al.*, 2013a).

IISA/IFAD (2014) lists other types of local survey that allow for comparability at the local level. The Integrated Modelling Platform for Mixed Animal Crop Systems, for example, is a standardized detailed survey instrument that captures the diversity of farming activities and characterizes the main agricultural production systems; it was developed to encourage data sharing by using standard protocols and enables combinations of tools to facilitate evaluations of farming systems. It is particularly useful for investigating farm production systems in a restricted context, and it provides a unifying framework for collecting data.

The system's Lite dataset includes details of household composition, agricultural production systems and activities, land and labour allocation in households, assets, income from on-farm and off-farm activities and food consumption; information on control over resources, land ownership and allocation of activities is gender-sensitive. The survey was carried out in 15 benchmark sites in East Africa, West Africa and South Asia. Analysis of the typology by the CGIAR Research Programme on Climate Change, Agriculture and Food Security is ongoing.

The RuralStruc survey was part of a 2007–2010 research programme entitled “Structural Dimensions of Liberalization in Agriculture and Rural Development”. Its objectives were: i) to increase knowledge about structural changes related to liberalization and economic integration and their consequences in the rural economies of developing countries; ii) to inform national and international discussion of the issues; and iii) to support policy-making (Losch *et al.*, 2011). It was managed by the World Bank and implemented in Kenya, Madagascar, Mali, Morocco, Nicaragua, Mexico and Senegal. One output was a merged core data file from six of the seven country surveys in 2007/08, in which the basic unit of observation and analysis was the rural household. The preference for rural households rather than farm households reflected the need to identifying the precise relationship between agriculture and other rural activities and sources of income. The surveys covered accommodation and quality of life, income sources, human and social capital, assets, development trends, on-farm activities, market integration, contract issues, food, household expenditure, credit and savings, change issues and activities.

The African Intensification of Food Crops for sub-Saharan Africa was a team researching the drivers of agricultural intensification in sub-Saharan Africa with a view to understanding the African food crisis and devising ways of alleviating it. The data were collected in 2002 and 2007/08 by means of interviews in farm households in Ethiopia, Ghana, Kenya, Malawi, Mozambique, Nigeria, Tanzania, Uganda and Zambia. The dataset consists of two parts: household-level data and village-level data.

The IIASA IFAD (2014) typology used surveys conducted by the International Food Policy Research Institute in Ethiopia: the 1989–2009 Ethiopian rural household surveys, the Ethiopia Nile basin climate change adaptation dataset, and the 1998–2000 dataset on policies for sustainable land management in the Ethiopian highlands.

### **3.4. Household budget surveys**

The household budget surveys are often organized along the lines of the World Bank LSMS to ensure comparability and open dissemination of data. The aim of LSMS is to facilitate the use of household survey data for evidence-based policy-making; it has been used in Albania, Armenia, Azerbaijan, Bosnia-Herzegovina, Brazil, Bulgaria, China, Côte d'Ivoire, Ecuador, Ethiopia, Ghana, Guatemala, Guyana, India, Iraq, Jamaica, Kazakhstan, Kyrgyzstan, Malawi, Morocco, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Panama, Papua New Guinea, Peru, Romania, Serbia, South Africa, Tajikistan, Tanzania, the United Republic of Timor-Leste, the Democratic Republic of Uganda and Viet Nam.

LSMS-ISA is a US\$19 million household survey project established by the Bill and Melinda Gates Foundation and implemented by LSMS in the Development Research Group of the World Bank. Because agricultural data in sub-Saharan Africa are affected by inconsistent investment, institutional and sectoral isolation and methodological weakness, LSMS-ISA collaborates with national statistics offices in its seven partner countries to design and implement multi-topic and nationally representative household surveys with a focus on agriculture. The primary objective is to foster innovation and efficiency in statistical research on the links between agriculture and poverty reduction.

The LSMS-ISA database covers Ethiopia, Malawi, Niger, Nigeria, Tanzania and Uganda. The plan is to conduct surveys every three years in all the participating countries to obtain longitudinal data; at present a cross-sectional database is available for these six countries; panel data are also available for Tanzania and Uganda.

The dataset is new and it facilitates comparability between countries, but shortcomings remain. Although the six countries include a section of questions on non-farm enterprises, the actual questions vary and not all aspects are included in all country questionnaires. In most of the countries, some questions contain different answer possibilities reflecting the participants and the national context (IIASA/IFAD, 2014). The surveys are, unfortunately, sporadic and tend to exclude commercial and corporate farms by focusing on vulnerable small-scale farmers. Because the LSMS may include households not directly engaged in farming, the unit of observation is the “rural household”, not the agricultural holding as in agricultural censuses.

The LSMS-ISA surveys use questionnaires on household, agricultural and community topics. The household questionnaire elicits data for the construction of a consumption-based welfare measure; it enables distributional and incidence analysis, and is likely to contain information on the following topics:

- household demographics
- education
- health and nutrition
- food consumption and expenditure on food
- non-food expenditure
- employment
- non-farm self-employment and other sources of income
- living conditions
- durable assets
- internal and international migration
- participation in projects and programmes

Information about asset ownership, control of household resources and participation in activities and programmes is gender-disaggregated.

The agriculture questionnaire collects information on core indicators identified by the LSMS team:

- Basic crop production, storage and sales
- Production of major crops, with emphasis on improved measures of
  - amount produced
  - plot size
  - production shocks

- Land holdings
  - size based on GPS measurement
  - tenure and titles
  - transactions
- Farming practices
  - mechanization
  - soil and environmental management
  - water management
  - adaptation to climate change
- Use of inputs and technology
  - family and hired labour
  - mechanization and equipment
  - seed varieties
  - fertilizer, pesticides and herbicides
- Access to and use of services, infrastructure and natural resources
  - agricultural extension services
  - infrastructure, including roads
  - credit, for agriculture and other purposes
  - access to markets and information
  - access to natural and common property resources
- Livestock
  - current number of animals, sales and expenditure on inputs
  - veterinary services
  - production and sales of livestock by-products
- Fisheries
  - amount produced, sales and expenditure on inputs
  - equipment

The community questionnaire collects information on topics such as access to public services and infrastructure, social networks, governance and retail prices.

The panel surveys collect information about topics such as agricultural production, non-farm income-generating activities and expenditure on consumption. The survey samples are designed to produce national and sub-national statistics for major geographical and agro-ecological zones; they cover

rural and urban areas to enhance understanding of geographical mobility and the spatial dimensions of development.

Another dataset that has evolved from LSMS is the Rural Income Generating Activities (RIGA) project, which promotes understanding of the role of non-farm activities in poverty reduction and development in rural areas. The internationally comparable database covers rural households' income sources drawn from household living standards surveys. RIGA also developed a standardized method for calculating incomes, which is applied in country surveys that meet strict data criteria. Most of the RIGA surveys were developed by national statistics offices in collaboration with World Bank's Living Standards Measurement Study (IISA/IFAD, 2014).

The database includes 35 surveys covering 19 countries in Africa, Asia, eastern Europe and Latin America. It has two subsets – the household-level income aggregate (RIGA-H), and the individual wage employment dataset (RIGA-L). the former includes a comprehensive measure of household income that presents aggregated and disaggregated data on income from sources such as crop and livestock production, household enterprises, paid employment, transfers and non-labour earnings. The RIGA-L database includes a single component on income and paid employment, which can be analysed at the individual and job levels. The RIGA database is composed of a series of constructed variables about rural income-generating activities created from the original data sources (see Box 12).

**Box 12. RIGA variables**

RIGA-H	RIGA-L
Paid employment in agriculture	Job type (5 categories)
Paid non-fam employment	Working time – full-time, part-time, per day, week, month, year
Crop production	Wages by sector or industry
Livestock production	Participation in paid employment, by sector or industry
Non-agriculture self-employment	
Total transfers	
Other income sources	
Total household income	

### **3.5. Official statistics, registers and administrative data**

Some typologies rely on official statistics and registers. The Chilean Ministry of Economy, for example, set up two simple national typologies covering all agricultural and other types of enterprise: one is based on annual sales, the other on the number of employees. These typologies do not involve extra costs for documenting agricultural issues such as surveys or agricultural censuses, but they are too restrictive for the capture and analysis of structural transformations. Local-level administrative data are useful for the identification of context-specific sub-types, and data from other sectors that affect farm households – health and infrastructure are examples – can contribute to the description of emerging types.

An interesting connection between farm registries and typologies can be seen in the work of Mercosur in Brazil. In June 2010, a REAF technical group was set up to promote discussion of the definition of “family farm” and investigate the mechanisms governing family farming records and farm registries. The group analysed the compatibility and diversity of the parameters used in the records and noted the observations of national delegations with a view to making the parameters that help to validate the criterion on productive resources compatible with the working capacity of the family.

### **3.6. Qualitative data from focus groups and typical farm surveys**

A large amount of data is required in order to simulate the effects of policies and interventions on different types of farms. The tools used often require in-depth understanding of the farms’ micro-economic operations and performance, which requires reliable data from sources other than national statistics systems. Such micro-economic data are usually accessed from farms that keep records of their operations or use an accountancy system, but in most developing countries such information is rarely recorded, especially on small family farms. Many countries must therefore set up additional data-collection systems restricted to a limited sample of farms identified in detailed classification systems: these are known as reference farms<sup>25</sup>. These surveys elicit socio-economic information about the farm types that can easily be updated at low cost; the Agribenchmark<sup>25</sup> and the International Farm Comparison Network<sup>26</sup> approaches in relation to dairy farms are noteworthy in this respect. The data

---

<sup>25</sup> <http://www.agribenchmark.org/agri-benchmark/who-we-are.html>

<sup>26</sup> <http://www.ifcndairy.org/en/methods/dairyfarm/index.php>

are frequently collected by extension and research organizations, and used locally for extension and advisory services, and the data-collection process is in itself a way of reinforcing the capacities of extension agents.

Interesting experiences in this respect include a case where farmers' organizations in Africa integrated their advisory and economic functions (CNCR, 2014): although it was not statistically representative, this approach led to coherent understanding of local farm types. Other initiatives are seeking to enhance connections with national-level statistics, for example by developing detailed national classification systems connected with agricultural census analysis: an example is the INOSYS typology described in Section 2.

### **3.7. The global strategy, minimum set of core data**

A combination of data sources would clearly improve the quality, quantity and diversity of information needed to build an international agricultural typology that is aligned with national and local characteristics. Drawing on several datasets with different sampling designs and reconciling the data is difficult and hence, expensive, so data sources that can serve to identify international types and take into account national descriptions of farm types are needed. The international types would then serve as a framework within which sub-types could be identified and analysed (Saravia Matus *et al.*, 2013a). The Global Strategy MSCF, for example, can be used to consolidate international types and obtain insights into national and local types.

The three pillars of the Global Strategy were:

- Pillar 1: Identifying an MSCD and determining national priorities.
- Pillar 2: Integration of agricultural and rural statistics into national statistics systems.
- Pillar 3: Sustainability of agriculture statistics through governance and statistical capacity-building.

Pillar 1 involving the MSCD proposed 58 core items in three domains – economic, social and environmental. A “core item” is one whose data are part of numerous indicators needed to monitor and evaluate development policies and food security. The core dataset then provided international-level information for policy-makers. The WCA is not the primary source for the core dataset, but it contributed to many of them and was particularly effective in countries with no established annual survey programme. In such cases the WCA 2020 items provided about a third of the Global Strategy MSCD for

census years; the censuses themselves provided a framework for specialized surveys of half of the core data items.

In Pillar 2, each participating country was encouraged to design a Strategic Plan for the Development of Agricultural and Rural Statistics. The development of a master-sampling frame for agriculture was an essential element of this, with agricultural censuses as one of the main sources of data for building the master sampling frame. The Global Strategy also is being developed the AGRIS programme, as described earlier, to overcome some of the limitations of censuses. In an integrated census and survey programme, the census of agriculture is used to establish benchmarks for subsequent agricultural statistics surveys and is a major reference for the reconciliation of data from different sources: the aim is to develop integrated statistics systems that can prevent duplication and the release of conflicting statistics, thus ensuring optimum use of resources. The modular approach to censuses serves as a transition to a fully operational integrated agricultural statistics system in countries with underdeveloped agricultural survey and census programmes.

Pillar 3 established the governance and capacities essential in sustainable national statistics systems. Policy-makers and other data users will support a system that provides reliable data relevant to their needs, so supplying national-level statistical information is hence an essential element of any sustainable system. Integrating agriculture into national statistics systems will require countries to develop appropriate governance structures and statistics capacities in their various institutions. In this context, capacity-building during censuses can contribute significantly to the enhancement of capacities in the domain of agricultural statistics (WCA, 2015).

Box 13 presents a draft version of the main variables collected under MSCD.

**Box 13. Global Strategy MSCD**

Group of variables	Key variables	Core data items	Frequency
Economic			
Output	Production	Core crops	Annual
		Core livestock	
		Core forestry products	
		Core fishery and aquaculture products	
	Area harvested and planted	Core crops	Annual
	Yield/births/productivity	Core crops, core livestock, core forestry, core fishery	Annual

Trade	Exports in quantity and value	Core crops, core livestock, core forestry, core fishery	Annual
	Imports in quantity and value	Core crops, core livestock, core forestry, core fishery	Annual
Stocks	Quantities in storage at beginning at harvest	Core crops	Annual
Stock of resources	Land cover and use	Land area	.... <sup>a</sup>
	Economically active population	Number of people of working age, by sex	
	Livestock	Number of live animals	
	Machinery	Number of e.g. tractors, harvesters, seeders	
- Inputs	Water	Quantity of water withdrawn for agricultural irrigation	
	Fertilizers in quantity and value	Main fertilizers, by core crop	
	Pesticides; quantity and value	Core fungicides, herbicides, insecticides, disinfectants, by core crop	
	Seeds; quantity and value	By core crop	
	Feed; quantity and value	By core crop	
Agro-processing	Volume of core crops, core livestock, core fishery used in processing food	By industry	
	Value of output of processed food	By industry	
	Other uses, e.g. biofuels		
Prices	Producer prices	Core crops, core livestock, core forestry, core fishery	
	Consumer prices	Core crops, core livestock, core forestry, core fishery	
Final expenditure	Government expenditure on agriculture and rural development	Public investments, subsidies, etc.	
	Private investments	Investment in machinery, research and development, infrastructure	
	Household consumption	Consumption of core crops, core livestock; quantity and value	
Rural infrastructure	Irrigation/roads/railways/communications	Area equipped for irrigation, roads (km), railways (km), communications	
International transfer	Official development assistance for agriculture and rural development		
Social			
Demographics of urban and rural populations	Sex		
	Age in completed years	By sex	

	Country of birth	By sex	
	Highest level of education completed	1 digit international standard classification of education, by sex	
	Labour status	Employed, unemployed, inactive, by sex	
	Status in employment	Self-employment and employment, by sex	
	Economic sector in employment	International standard industrial classification, by sex	
	Occupation in employment	International standard classification of occupations, by sex	
	Total income of household		
	Household composition	By sex	
	Number of family/hired workers on the holding	By sex	
	Housing conditions	Type of building, main material, etc.	
Environmental			
Land	Soil degradation	Variables based on core items on land cover and use, water use, other inputs to production.	
Water	Pollution from agriculture		
Air	Emissions from agriculture		
Geographic location			
GIS coordinates	Location of statistics unit	Parcel, province, region, country	
Degree of urbanization	Urban/rural area		

### Main message – Section 3

This section shows the different sources data sources that collect and handle information at the level of the agricultural holding and agricultural household holding, as shown in Table 12.

**Table 12. Overview of data for typology building**

Type of data	Scale	Producer of data	International framework and dissemination	Frequency
1) Agricultural census	National, agricultural holding, comprehensive	National statistics institution or statistical unit of ministry of agriculture	WCA; aggregated results; little open data	5 or 10 years
2 National survey	National, sample, other	Usually ministry of agriculture	No.	Usually more frequent than census
3) Local survey	Local; not always representative	Various: research, project, local institution	No	Uncertain
4) Household budget survey, e.g. LSMS	National, household, sample	Ministry of statistics, economics or social affairs	LSMS as framework, with open dissemination of micro-data	Usually annual
5) Registers and administrative data	Various; usually no specific sampling	Often government, but data gathered in administrative processes	Not at international level; some regions provide framework	Uncertain
6) Geographical information, satellite information	Global to local level; not usually on holding; land use only		FAO provides framework for classification of land use etc. and global system of dissemination	
6) Qualitative data from focus groups or by observation	Various; no representative	Various; may include farmers, researchers	No	

Most of the basic classificatory principles such as labour usage, management style or output orientation are included, but the possibility of associated variables and related thresholds is still variable, particularly with regard to asset levels.

Initiatives such as AGRIS and MSCD are promising in terms of constructing internationally comparable agricultural datasets, particularly if they can be integrated as proposed in the Global Strategy pillars. In the meantime countries have to work with the information in their statistics systems: this calls for guidelines for using typology-based tools to analyse agricultural transformations. National classifications of holdings are also an important basis for sampling farms to collect detailed micro-economic information: examples include INOSYS, FADN and Agribenchmark.

The main recommendation from the review is that few classificatory principles or basic variables such as percentage of family labour, household or non-household management and percentage of output sold may be used to identify international types with a view to reducing the number of types that can be identified and compared for cross-border analysis and policy dialogue.

# 4

## Proposal for an International Framework of Agricultural Typology

This chapter presents an initial proposal for an international framework of agricultural typology that incorporates some of the lessons and best practices from the literature review.

### 4.1. Purpose and objective of an international framework of agricultural typology

The literature review reflected the need for typology-based tools for analysis of policy-relevant topics in the agriculture sector. Typologies are usually developed to capture the diversity of agricultural agents in their contexts and to show their evolutions and transformations.

Among the varied typological exercises reviewed, few examined the characteristics of agricultural holdings as opposed to farming systems, strategies, development pathways or rural settings. In the frameworks that did focus on the characterization of agricultural holdings, the emphasis was on market orientation, management style, size and assets and sometimes production systems. Agronomic and socio-economic contexts were included when the “agricultural holding” unit was the basis of the typology.<sup>27</sup> This shows that the inclusion of a range of topics in a single typology framework is challenging.

Another gap in the international typologies based on agricultural holdings was that they were either based on family farms and did not consider other types, or the identification of the family-farm sector was not fully explored; an exception in this respect was the WAW framework, which analysed family farms along with family business and corporate farms. There is hence a need to develop an

---

<sup>27</sup> An exception was the IIASA IFAD (2014) framework, which focused on farming systems, not agricultural holding units. In Fan *et al.* (2013) information on the socio-economic context is included, but the unit of analysis is “strategies of behaviour” not the agricultural holding.

international framework to typify agricultural holdings that identifies family farms and other forms of farming, but that also covers other agents in the agricultural sector such as landless workers and herders with information about their organization, orientation, production systems, economic size and the agro-ecological and socio-economic context. There is also a policy-related interest in developing a framework that makes it possible to identify and describe types at the international, national and local scales on various axes of analysis. This kind of framework must be extremely versatile to enable the development of international, national and local types that take policy-relevant topics into account as required.

In short, a flexible system is needed that enables policy-makers in international institutions, governments, development agencies, farmers' organizations, civil society and non-governmental organizations to use findings from a comparable cross-border agricultural typology covering the international, national and local levels. Users will have different interests as to the scale of analysis and policy-related issues: international researchers may focus on international types that show the effects of global challenges, whereas others may wish to analyse the effects of policies in specific contexts such as climate-related challenges for farms producing particular crops.

An international framework of agricultural typology could also contribute to the development of systems for monitoring agricultural transformations at various scales of analysis. Such a framework could support evaluations of the effects of policies in development contexts and foster comparisons and international policy dialogue on possible interventions in the agriculture sector.

## **4.2. Organization: layers and axes**

A major finding from the literature review was that a combined construction approach is the most suitable for establishing a comparable agricultural typology that connects the global, national and local levels. This can be achieved if connecting layers are established between the three levels. Such connections should flow from the macro-scale to the micro-scale and provide feedback from the local layer to the national and global layers. Likewise, higher layers of types will be largely driven by a deductive approach while lower levels which incorporate types with more details will be mainly derived from statistical or bottom-up procedures.

The proposed international framework is based on a system of layers, with and axes that reference policy-relevant aspects of agricultural development. The

layers and axes relate to classificatory principles that identify farm types and descriptive variables that describe them.

#### **4.2.1. System of layers**

##### **From the international to the national and local layers**

The literature review showed that it would be best to start with a deductive approach in which classificatory principles and the related variables and thresholds are established to identify international types and maximize international comparability. In identifying national types, which are sub-types evolved from the international types, the type structure should be maintained but the number of types must be increased to suit the national context. This could be done by means of a deductive or a statistical approach, or a combination of the two: the issue is still unresolved because few attempts have been made to establish a connection in terms of scale. If a statistical method is used it is possible to derive the classificatory principles from the national dataset, whereas if classificatory principles are selected in advance international comparability could be enhanced at this stage. The selection or combination of approaches is determined by data constraints and policy needs in terms of type identification at the national level. Local types – the third layer, evolved from the national layer – can be identified by means of statistical methods and expert views; this could include the introduction of farm models based on local-level data. This requires the collection of additional data using the refined typology as a sampling frame to select representative farm types that can be further surveyed or modelled. At lower layers of the typology, territorial analysis could be substantially enhanced, for example by including agrarian diagnosis or participatory schemes.

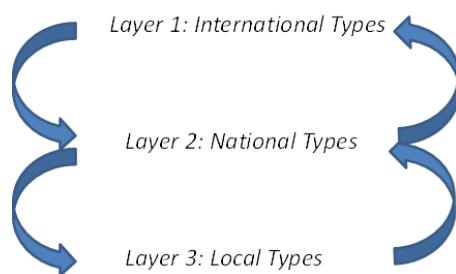
There are currently no guidelines for the assessment of territory-specific contexts when a typology has been built at a larger scale, but the development of an international framework that incorporates the diversity of farm types at the national and local levels would be useful in terms of policy-making and designing interventions, an approach that could also be useful when territories are in the process of transformation or experiencing climatic, economic, social or political events.

## **From the local to the national and international layers: an iterative and interactive process**

Local findings and expert consultations can be a preliminary step in refining a typology at the national level, particularly when national statistical data are lacking: see Guanziroli *et al.* (2013) on Brazil, Scheinkman de Obschatko (2009) on Argentina and *Chambre d'Agriculture* (2012) on INOSYS. This approach was also used in the WAW framework, in which the criteria selected in advance to identify international types were tested in country case studies.

National-level analysis usually requires local knowledge to guide the interpretation of data. In the proposed typology, therefore, the flow must not be solely from the international to the national and local levels: it must be an interactive and iterative process in which lower layers of the typology also feed into the higher levels to maximize accuracy in the definition of types. The process will involve stakeholders such as producers' organizations, academic institutions and policy-makers, and will ensure that the analysis of findings covers a variety of topics associated with current and future agricultural transformations, not just policy-making as at present.

The diagram below encapsulates these flows of information:



### **4.2.2. Axes of analysis**

The matrix approach proposed in the EU classification system and tested in Tanzania by IIASA constitutes a lesson for the proposed international framework of agricultural typology. In it, axes of information and classification are established to expand the potential for analysis and comparison among types in terms of policy issues is facilitated, particularly at the international level. Another advantage of axes of analysis is that they consider selected variables at the macro scale, with detailed information incorporated at the

medium and micro scales. The following thematic axes are considered for the identification of types across the international, national and local layers.

### **1: Structure and market orientation axis**

This axis introduces the distinction between family farms and other forms of farming. It focuses on the structure of agricultural holdings to show how they evolve or transform: the concepts of family, family business and corporate farms are covered, with classificatory principles related to labour usage and legal status and management style; the market orientation element identifies farms as commercial or semi-subsistence. This is close to the basic proposal in the WAW framework of using three identifying criteria.

This axis also incorporates information on off-farm income-generating activities at the agricultural holding level and the extent to which agriculture is the main livelihood of farm households, which provides further insights on the orientation of a holding. These elements indicate the extent to which these farms are linked with agricultural activity in terms of own-consumption or sales and with other non-agricultural activities. It can help, for example, to distinguish semi-subsistence farms from subsistence farms with few off-farm activities – usually the poorest and most vulnerable – and from semi-subsistence or subsistence farms with significant off-farm activities such as “patio” farming or “hobby” farming in which income is derived from non-farm sources with farming supplying food for home consumption.

The importance of off-farm criteria reflects RIMISP/IFAD (2014) on family farms in Latin America and the IWG FF final report (Ramos, 2014). At the international level the classificatory principles associated with Axis 1 include dichotomous variables for the categorization of agricultural holdings based on labour usage, legal status, management, market orientation and off-farm activities. As national and local types are developed, the thresholds for each classificatory principle can be refined, and other classificatory principles such as information about assets or income sources may be included. This approach allows for a larger number of types at the national and local levels.

### **2: Production system and economic size**

This axis is built on indicators using a similar variable that provides standard economic value for production of crops and animals on the basis of land use, livestock and local standard values for elements such as yields and prices. This approach is used in the EU and the United States, and there is interest in other countries: tests are under way in Tunisia, for example. It enables comparison of

quantities produced and assessment of production systems and the degree of specialization at the agricultural holding level. It also makes it possible to aggregate production to estimate “economic size” at the holding level per worker and per hectare: this component of the axis enables comparisons among farms involved in different agricultural activities and their levels of production. In developing countries and with regard to farms mainly involved in subsistence farming, the axis can provide information about the potential level of food security associated with food production by comparing “economic size” with annual food budgets.

In the sub-axis on production systems, an initial classification could be whether a holding grows crops, raises livestock or operates a mixed system. This can be used in the international layer if the classification is broad enough. The extent-of-specialization dimension increases the level of detail by identifying crop-specific production systems, for example. In principle, crop-specific analysis of types can be undertaken at the national or international level as required. The WAW case studies in France and Nicaragua, for example, showed that the production orientation of family, family business and corporate farms was usually different, with significant effects on farm performance. In such cases the relevance of analysis of the structural categories was limited, and further analysis in more homogeneous production systems was required. The information about production systems also served to verify market orientation at the agricultural holding level: a coffee or cocoa farm, for example, is usually wholly oriented towards output sales, not own-consumption.

The information in the economic size sub-axis can help to establish comparisons among farm types involved in different agricultural activities and other enterprises. In developing countries, the values can be used to assess economic size: this is usually related to accounting information on matters such as sales, cash income and capital and hence is normally established at the national level, taking local constraints into account. Analysis of economic size is integrated into the regional typologies of the EU and USDA, though they are not directly comparable because their data systems are different.

Work on capturing economic size in Brazil followed country specificities, an approach to be recommended given that information about economic size is obtained in the national and local layers of the typology. The main advantage of introducing a parameter for economic size is the possibility of comparing holdings with different production systems and considering issues other than physical size at the country level. Modalities could be designed to facilitate comparison, for example by using purchase price parity to convert the factor, or

by comparing economic size per worker with local incomes or wages to separate farms that generate similar incomes or farms where most income is derived from non-agricultural activities.

### **3: Agro-ecological and social setting**

This axis captures the agro-ecological and socio-economic context in which an agricultural holding operates. It could also capture information on the agronomic context, or explore issues associated with poverty, inequality and food security. At the international level, the distinction could be based on whether a farm operates in a tropical, sub-tropical or temperate environment – broad agro-ecological zones based on the FAO-IIASA GAEZ. From the socio-economic perspective, it can show whether farms operate in a context of low or high incomes, food insecurity or poverty. In the national and local layers, the characteristics associated with the socio-economic dimensions can be related directly to farm households and could therefore incorporate analysis of gender and sustainability challenges.

The three proposed axes would not necessarily be combined simultaneously at the international, national and local levels, because it would render far too many types. Specific combinations of Axis 1 with one of the others in their simplest form where they establish broad thresholds could be undertaken at the international level.<sup>28</sup> At the national and local levels, different degrees of detail and combinations of axes may be proposed in accordance with policy needs and data availability. All the axes are important components of regional typologies, but they are not often assembled or considered together.

In sum, Axis 1 incorporates information about farm structure and orientation, Axis 2 provides information about farm activity in terms of size and sector-specific limitations, and Axis 3 incorporates agro-ecological and socio-economic settings. Together they produce a well-rounded view of agricultural types. An international framework based on these axes could hence facilitate comparisons and aggregation in similar categories and policy-relevant topics.

---

<sup>28</sup> Axis 1, for example, could be combined with the “raw” forms of crop, livestock or mixed production systems from Axis 2, or the agro-ecological and socio-economic dimensions from Axis 3.

### **4.2.3. Layers, axes and classificatory principles**

The proposed international framework for agricultural typology is organized on the basis of layers and axes, which together define the classificatory principles to be introduced in the first layer of the typology to define the international types from which national and local types can be derived.

#### ***Layer 1: International types***

This layer is concerned with the identification of international types, which are to be defined on the basis of a few classificatory principles with dichotomous classes, or at best three classes, and international data frameworks such as censuses, as in WCA 2020, and eventually with harmonized household data from initiatives such as AGRIS and LSMS-ISA. The objective is to obtain a small number of types to maximize manageability and facilitate international policy dialogue.

At the international level, Axis 1 is the starting point for analysis. It is aligned with the criteria proposed by IWG FF for identifying family farms internationally with international types to be defined deductively on the basis of the three classificatory principles identified as essential item in WCA 2020: labour usage – items 902 and 903; management style and legal status – item 103; and purpose of production – item 107 – distinguishing semi-subsistence and commercial farms. In the absence of variables for “actual purpose of production”, economic size and production system can also be used to cover semi-subsistence and commercial farms, as in the WAW case study in Nicaragua.

This approach would produce five basic farm types:

1. family farm with semi-subsistence orientation;
2. family farm with market orientation;
3. family business farm with semi-subsistence orientation;
4. family business farm with market orientation; and
5. corporate farm.

The thresholds for these types are broad and hence provide for further detail in the lower layers: a minimum of 50 percent use of family labour, for example, is set to identify family farms, and if the figure is below 50 percent family business farms are identified; corporate farms are identified by 100 percent use of hired labour. In terms of market orientation, a minimum of 50 percent of

output sold identifies farms integrated with markets. Legal status is a matter of whether a holding is household managed, as in types 1 to 4, or not as in type 5. Corporate farms could be identified in more detail by introducing a separate criterion to show management types and objectives – private agricultural enterprises with shareholders, public entities, planting pools and collectives are examples. This could be based on the interpretation of responses to WCA 2020 item 103 “legal status”.

Another important variable in many typological studies of family farms or smallholders<sup>29</sup> is the diversification of income sources (RIMISP/IFAD 2014). Information about farm orientation could hence be supported by introducing data for off-farm activities to distinguish semi-subsistence family farms with significant off-farm earnings from those dependent on their agricultural activities. This can be done in the international layer, but the unit of analysis would have to be adapted. Such diversified farm-households are sometimes excluded from censuses as non-agricultural holdings and referred to as “garden” or “hobby” farms. Seasonal agricultural workers, who are among the most vulnerable agents in rural areas, are also sometimes excluded. Types that include off-farm activity could be formed on the basis of the data provided on essential census items such as WCA 2020 item 901 – whether working on the holding is the main activity. WCA 2020 Item 108 – other economic activities of the household – could be used in the national or local layers of the typology to classify farms according to the nature of their off-farm livelihoods.

Extending the “agricultural holding” unit of analysis to include landless rural inhabitants will involve consideration of new sources of data (see 4.2.4). The FAO definition of agricultural holding is broad, and in the household sector “... there is usually a one-to-one correspondence between an agricultural holding and a household with own-account agricultural production activities (either for sale or for own use).” It is likely that most landless agricultural workers have gardens or keep animals on collective land and would therefore be included in censuses, but many countries still provide a minimum threshold for the definition of agricultural holding and may exclude them. This segment would then be excluded from agricultural surveys but might be used in population surveys; the integration of such sources is rarely straightforward. The inclusion of all relevant agents in an international typology hence requires a number of additional tasks.

---

<sup>29</sup> Latin American family farm typologies and part of the classification system in the USA.

From Axis 1 and information about a broad set of agents to be typified, including an additional classificatory principle for off-farm activities, the following types would emerge at the international level:

1. landless agricultural workers;
2. semi-subsistence family farm with main income outside farming;<sup>30</sup>
3. semi-subsistence family farm with main income from agriculture;
4. market-oriented family farm;
5. semi-subsistence family business farm with main income outside farming;
6. market-oriented family business farm with main income from agriculture; a additional distinction could be whether a family member or an external individual is in charge of management;
7. market-oriented family business farms with main income outside farming; usually with a hired manager and little use of family labour; and
8. corporate farm.

For Axis 2, a simple international classification based on cropping, animal production or mixed production systems could be produced; it could build on the WCA 2020 essential items, particularly item 202 – area according to land use – item 501 – number of animals – and item 1201 – aquaculture. Axis 2 could be combined with Axis 1 because it can crosscheck the “purpose of production” element by identifying production systems that are typical of semi-subsistence and commercial farms, as in the WAW case study in Nicaragua (Even *et al.*, 2014). At the international level, Axis 2 could enable comparison of structural types in homogeneous production systems and also use a matrix approach to compare the relative distribution of structural types in major production systems:

---

<sup>30</sup> In WAW (2014) this type is further divided between marginal and multi-active farms in terms of differences in asset levels and the viability of on-farm and off-farm activities.

<b>Axis 1 / Axis 2</b>	<b>Production based on cropping</b>	<b>Production based on livestock</b>	<b>Mixed production, aquaculture or forestry</b>
Family farms and sub-category based on market orientation and off-farm activity	Family farm holdings under crops	Family farm holdings with livestock	Family farm holdings under mixed systems, aquaculture or forestry
Family business farms and sub-category based on market orientation and off-farm activity	Family business farm holdings under crops	Family business farm holdings with livestock	Family business farm holdings under mixed systems, aquaculture or forestry
Corporate farms	Corporate farms under crops	Corporate farms with livestock	Corporate farms under mixed systems, aquaculture or forestry

In principle, crop-specific assessments would make it possible to adjust types to investigate the farms in a given sub-sector such as family, family business and corporate farms growing coffee from an international perspective. The economic size dimension would be excluded at the international level but explored in the national layer by adapting measurements to the country context.

With regard to international types, Axis 3 could be based on the GAEZ agro-ecological classification and in its shortest form could cover tropical, sub-tropical and temperate zones. The classification could of course be expanded to adjust to higher and lower national levels and could therefore help to establish the number of family farms in particular agro-ecologies. In the socio-economic component, regions and countries could be distinguished in terms of dependence on agriculture, access to markets and overall prosperity, as suggested by Fan *et al.* (2013), Berdegué *et al.* (2011) and OECD (2009). Axis 3 could build on WCA 2020 item 101, which provides the locations of holdings and combines the data with other information about location from GIS and administrative maps of food security and poverty status.

In sum, international types originating in the core aspects of Axis 1 can be combined with the elements in Axis 2 to provide a more general view of agricultural holdings. Variables that do not contribute to identification can therefore be used to describe types. Box 14 summarizes the classificatory principles and data sources in the international layer of the typology and its axes.

**Box 14. International layer of the typology: classificatory principles, axes and data sources**

The establishment of criteria for identification as opposed to the description of types and sub-types is a current issue in the development of typologies because the criteria are not uniformly used in the literature. The first step is to distinguish between these two types of variable to enhance the comparability of results and create consistent types defined by their inherent characteristics and not external circumstances. This will make them more reliable and hence more useful in terms of replication.<sup>31</sup>

Distinguishing between the variables for identification and description is particularly relevant in the international layer of the typology proposed here because the international types are the departure point for international comparison and further development of national and local types, a process involving the transformation of previously defined descriptive criteria into identifying criteria to create sub-sets of holdings. The table below covers the main classificatory principles and thresholds for the definition of international types, with the associated data sources.

Axes of analysis	Data source	Variable/threshold
Axis 1: Structure and market orientation		
Labour usage: working time on holding, family and employees	WCA 2020 items 902 and 903	Over 50% family labour=family farm; less than 50% family labour=family business farm; 100% hired labour=corporate farm
Management style/legal status	WCA 2020 item 103	Household / non-household
Market orientation: purpose of production)	WCA 2020 item107	Commercial / own-consumption
Off-farm activity; agriculture is/is not the main activity	WCA 2020 item 901	Agriculture is/is not main activity
Axis 2: Production system and economic size	WCA 2020 items 202 – area according to land use; 501 – number of animals; 1201 – aquaculture	Select main production: crop, animal, mixed, aquaculture
Axis 3: Agro-ecological and social setting		
Agro-ecological	GAEZ (FAO-IIASA)	Tropical, sub-tropical, temperate
Socio-economic	WCA 2020 item 101 – location; FAO Hunger Map; Fan <i>et al.</i> (2013) country classification	Agriculture-based, transforming or transformed

<sup>31</sup> The proposals of the IGU international agricultural typology, which distinguishes between internal and external traits, can be adopted. The WAW framework is also useful: it uses a small number of variables for identification, and suggests descriptive indicators for policy analysis with regard to matters such as food security status at the holding level and territorial components affecting agricultural holdings.

## **Layer 2: national types**

There are various approaches to defining the second layer of the international typology, which relates to the national types that evolve from the international types: i) the classificatory principles selected in advance for national and local types are retained (see Box 14), but their thresholds are divided with a view to identifying new types; or ii) new classificatory principles based on policy interests and data availability are introduced. In Axis 1, option (i) can be implemented by altering the established thresholds from 50 percent to give two classes, or to other values to give more classes. In the case of off-farm activities, holdings can be classified according to their main source of income outside agriculture. With regard to option (ii), an additional classificatory principle aligned with Axis 1 could be asset-based information at the agricultural holding level.

A third option is to expand national typologies by introducing identification variables associated with production systems and economic size: this could include details of production systems such as crop mixes, combined livestock and cropping systems, forestry and aquaculture. Information on economic size would augment concepts of size based on land surface, which do not account for different types of production – 1 ha of cereals is very different from 1 ha of vines – and cannot incorporate levels of animal production. This require the creation of a national coefficient to compare different types of production and determine thresholds among categories: the measurement of standard outputs in the EU typology is a good example.

Alternative methods for identifying and categorizing types of agricultural holding on the basis of economic size can also be considered. In Brazil, for example, Guanziroli (2013) estimated “economic production level”, which was then divided by assumed opportunity costs of labour defined as the daily rate + 20 percent to determine relative income; this varied from half a wage to more than three times the agricultural wage. Countries could also develop proxies to provide further classification of farm types in term of structure, for example by combining criteria related to assets and mechanization with a combination of nationally relevant thresholds such as surface irrigated or number of animals. At the regional level in Argentina this approach gave an idea of the economic size of agricultural holdings (Scheineman de Obschatko, 2009).

The current FAO initiative to develop internationally harmonized rural livelihood indicators could augment the information on actual income levels among agricultural agents so that they can be classified and could enhance

comparability because the common basis of income calculation is used (FAO, 2014b).

Axis 3 can also be incorporated and extended in the consolidation of national types. This can be achieved by updating national agricultural zoning and poverty and food security information, and by including areas vulnerable to weather shocks in the analysis. The use of administrative data could also be useful because political components may be relevant and reflected in the classifications.

### ***Layer 3: local types, for locally-based analysis***

At this level, detailed information on livelihood strategies, assets, production systems, economic size, agro-ecological zones and socio-economic constraints could be fully incorporated: it would produce a large number of classes and consequently types, but coherence with higher layers would be preserved. The characteristics emerging from the three axes can, in short, be combined to address local requirements. Cross border analysis and comparisons of the emerging sub-national and local types may hence be reduced because territorial elements, particular mixes of production systems and approaches to measuring economic size may not be directly comparable, and assets included to identify local types may be context-specific.

The local types can be specific to a national region, and could be assessed in detail by means of farm-household models to inform local planning. It is also possible at this level to support further sampling and data collection. It must be borne in mind, however, that as more characteristics are included to identify types, descriptive variables related to territory may become identifying dimensions: this would leave less room for descriptive assessments.

#### **4.2.4. The unit of analysis, data sources and the international framework of monitoring systems**

The proposed international framework of agricultural typology uses the FAO definition of farm-households in which landless people, nomadic herders and farm-households that are not specialized in agriculture or do not have agriculture as their main livelihood are typified along with family, family business and corporate farms.<sup>32</sup> The objectives of this broad concept of the unit

---

<sup>32</sup> The IWG FF typology includes landless people working in agriculture. The category is often included in policy dialogue on agricultural structures and structural transformations and is proposed in the OECD, World Bank and IWG-FF frameworks. The share of the agricultural

of analysis, which considers agricultural holdings and also the diversity of rural agents, are to enhance understanding of the different forms of farming and participation in the agricultural sector and to capture rural transformation trends.

The WCA programme uses a broad definition of agricultural holdings that includes agricultural households with own account agricultural production (Even *et al.*, 2014). In view of cost and data-collection constraints, however, countries apply their own definitions and thresholds, and rural households partially engaged in agriculture or below a minimum size, sale or production threshold tend to be excluded. This has implications for rural food -security assessments, which may exclude the most vulnerable groups. To overcome these issues, greater harmonization among censuses and household-level surveys is needed. In the meantime, the proposed international framework of farm typology must explore the possibility of obtaining information from national-level sources such as household surveys, administrative data and field assessments and complementing censuses by collecting additional data from agrarian diagnostics and expert consultations. This is essential with regard to the corporate sector, which is rarely the subject of statistical surveys and hence cannot be analysed with statistical methods (Even *et al.*, 2014).

Table 13 shows the information sources for some of the identified international types based on a broad definition of the unit of analysis: landless agricultural workers, for example, who may be without a clear source of income, could be captured in population or household surveys. Semi-subsistence family farmers whose main livelihood source is outside agriculture may be captured in population or household surveys, unless the agricultural census includes them. Semi-subsistence family farmers who are mainly dependent on agriculture and market-oriented family farmers will usually be identified in agricultural and population censuses, as will semi-subsistence family business farms even if the main source of income is outside farming. For market-oriented family business farms, whether farming is the main source of income or not, information may be found in agricultural and population datasets and in business surveys and national registries, provided that the farm is registered as a business. Data on

---

population in own-consumption production or salaried work is often a significant criterion of transformations and types of land distribution. Analysis of the conditions and salaries of these agricultural workers seems to be important, and can also be compared to conditions and income in agricultural holdings. Further work is needed to define “landless” and determine whether this type incorporates people with very limited land such as a “private garden”, and where to place herders who use common land or purchased fodder and activities based on other uses of natural resources. In any case, the category may not be characterized in the same way as agricultural holdings.

corporate farms may be found in agricultural censuses, business surveys, tax records and registries.

**Table 13. Potential sources of information for international types**

International type: broad definition of the unit of analysis	Agricultural census	Population or household surveys	Business survey/tax records/national registry
Landless agricultural workers		X	
Semi-subsistence family farm with main income outside agriculture	X	X	
Semi-subsistence family farm with main income in agriculture	(X)	X	
Market-oriented family farm	X	X	
Semi-subsistence family business farm with main income outside farming	X	X	
Market-oriented family business farm with main income in farming	X	(X) sometimes excluded when separate legal business	(X) depends whether registered and on national system
Market-oriented family business farm with main income outside farming, possibly managed by the family but with little family labour	X	(X) sometimes excluded when separate legal business	(X) depends whether registered and on national system
Corporate farm	X but sometimes sampling problems		X

X denotes that the information source can identify the related international type.

(X) denotes exceptions to such data collection processes.

Another consideration with regard to data sources and the unit of analysis relates to the generation or adaptation of monitoring systems aligned with the international framework of agricultural typology.

Most of the literature on agricultural transformations first investigates current trends such as vertical and horizontal integration, externalization and diversification that drive rural transformations (Saravia Matus *et al.*, 2013b; Losch *et al.*, 2012); the trends will of course be different in different agricultural regions. There is currently a gap in terms of identifying the effects of global trends at the local level of agricultural holding: this will require the identification and monitoring of a set of variables to capture the effects of agricultural transformations in terms of who produces, what is produced, the purpose of production and the resources used. Further analysis is also needed to

assess the socio-economic, environmental and political consequences of such transformations in the agricultural sector and elsewhere.

Section 2.3 showed the variety of potential mechanisms for the assessment of transformations at the global, national and local levels, but identified no single framework that integrates the three levels and considers the variety of rural agents. Another issue is that countries adopt different monitoring systems according to their resources and the availability of data: examples include: i) statistics-based investigations that rely on quantitative data from censuses or other surveys; ii) investigations that gather and organize administrative data from sources such as accountancy systems, quality controls or taxation records; iii) investigations that use “representative” or typical farms, which usually rely on meetings of experts and local-level modelling to capture farm-level changes; and iv) investigations based on farm registries. They are hence dependent on the context in which they are carried out, but there is one common feature in that they are usually associated with typologies to define the object of monitoring and capture its transformations. An interesting case study that combined different data sources was the French livestock farm networks (see Box 15).

#### **Box 15. Livestock farm networks**

According to Jousseins *et al.* (2011), systems for monitoring and analysis of livestock farming in France date from the late 1970s. A feature of these systems was the idea of building development projects in partnerships, which was supported by the state and by leading farming professionals. In France, many grassroots players have a tradition of joint work in organizations such as chambers of agriculture, farm management centres and technical institutes: this gave impetus to the formation of livestock farm networks.

The current networks developed from the 1981 *Eleveur Bovin Demain* initiative, in which regional and departmental engineers were commissioned to monitor efficient and innovative livestock farms with a view to establishing technical and economic benchmarks adapted to regional contexts and applying them to as many farms as possible to indicate future possibilities – and foreshadowing the “sustainable development” concept. Analytical methods were refined and monitoring, collection and centralization tools were developed using the French Livestock Institute’s *Diapason* software. The system then changed its name to the Livestock Farm Networks. Its mission is: “... to observe the livestock farming systems in place in the regions, to identify and support innovative systems, and to transfer and distribute the productions in the form of tools, methods, training and publications. To do this, the system is organised so as to describe farm functioning in the form of global references, expressing various possible balances and in a defined local context. The detailed and regular monitoring of farms over several years also makes it possible to describe farm evolution patterns and paths of evolution which lead to new balances.”

In terms of funding, *FranceAgriMer* provides strong support in association with the Ministry of Agriculture. Public funds from sources such as CASDAR – the special account for agricultural

and rural development – are also provided.

With regard to monitoring, the system makes it possible to illustrate the diversity of French farms but does not aim at exhaustive representation of all French livestock farms. The monitoring covers the main agro-ecological and productive zones and provides detailed knowledge of the functioning of livestock farming systems, so the choice of systems to be monitored is made in conformity with the objectives of each system.

Implementation of the system relies on regional organizers, technicians and the livestock farmers themselves. The regional organizer coordinates the work, determines the methodological framework and provides the monitoring tools. The technicians of the Chambers of Agriculture make regular visits to the farms at particular periods of the year to investigate objectives, past changes and future projects and to collect information on workforces, means of production, technical results, economic results and environmental effects. The technicians and livestock farmers are in constant dialogue; the technicians collect information and advise the farmers, who can ask to work in studies or projects with a view to farm improvements.

The regional teams meet regularly to harmonize and process the data collected, which are stored in a national database managed by the French Livestock Institute. Nationwide discussion among regional organizers ensures that the work is harmonized over the whole of France and leads to the publication of: i) regional and national technical and economic benchmarks for each system – specialized sheep farming in the Massif Central and mixed crop and livestock farmers in the south-western plains are examples; ii) syntheses of studies of topics such as energy use in livestock farming and mechanization; and iii) the results of annual surveys, with the methods and tools used. New themes are being introduced such as mineral balance, energy use and production costs.

In short, analysis and comparison of numerous farms makes it possible to build coherent and efficient farm typologies. These functional farm types are useful for advisers in simulating farm projects and distributing functional markers, and for politicians wishing to study the effects of change with a view to developing support policies.

This case study provides lessons for building an international framework for agricultural monitoring aligned with the agricultural typology proposed in this report. In countries with limited resources, for example, the development of typologies at the national and local levels can support the selection of farms for detailed monitoring, and drawing on local expertise can help in the identification of agricultural challenges. In developed countries, monitoring can be accompanied by extension services and technological support, which is one of the objectives of the French Livestock Institute. A feature of the French livestock networks is that local reports are studied at the national level to identify trends that may be relevant for policy-makers at higher scales of analysis. The trends can be replicated at different scales of analysis so that movement from national to regional and international contexts is possible.

This approach makes it possible to document local-level data collection and analysis for replication elsewhere, because local monitoring systems can be

aligned to support national systems that feed into the international sphere. Although methodological challenges remain in terms of adapting typologies in response to structural changes (see Section 2.3), the typology-based tool is an essential starting point for analysis. Synergies with innovative projects such as Agrimonde-Terra could be further explored, particularly to include statistics-based information and stakeholder analysis to enrich the understanding of transformations (see Box 9).

#### **4.2.5. Adaptation of the international framework to the national level: basic steps**

The layers and axes in the international agricultural typology make it possible to establish a restricted number of international types that can be described in greater detail as the analysis moves down to specifics at the country level; the information in each axis can be expanded as the scale of analysis reaches the local level. To ensure comparability and coherence among the layers, types must be defined in a step-by-step procedure.

Even *et al.* (2014) summarize the steps for developing an international typology based on the five typology implementation exercises. The main advantages of the WAW framework are that it enables movement from the global to the local context and that it can be adapted to align with the International Framework of Agricultural Typology. The steps are:

- i. Initial analysis to clarify the nature of the typological work, assess data sources and explore the literature on issues such as agrarian diagnosis and policy objectives; selected stakeholders may be contacted at this stage.
- ii. Selection and organization of data related to the classificatory principles required in the international layer of the typology, including information from the axes. At this stage the classificatory principles and their thresholds are largely pre-determined to maximize comparability.
- iii. Development of a “clean” database for the consolidation of national types. Additional information can be drawn from country-level typological studies, assessments of transformations, fieldwork and stakeholder consultations. Data sources such as population surveys or business surveys should be integrated where possible. Expert support for data collection and handling may be needed.
- iv. Identification and description of national and local types, introducing the combined construction approach that includes statistical analysis to identify and describe types.

- v. Combination of statistical information with data from administrative sources and interviews and further data collection to improve types in every layer. Training in sampling and survey techniques may be needed.
- vi. Analysis of typology findings to inform policy-making; stakeholders should be involved to provide feedback at all levels. Guidelines on stakeholder participation may be needed .
- vii. Dissemination of data and findings to inform monitoring systems. Guidelines on the development of monitoring systems will be needed in areas that lack them.

Factors that prevented straightforward comparison of findings in the five WAW typological studies were that different indicators and thresholds were used for the three classificatory principles in the international layer, and that variables were sometimes used for identification and sometimes for description, which made comparison difficult. In the proposed framework this handicap would be overcome by establishing at the outset a common set of thresholds for classificatory principles used in the definition of the international types as the basis for international comparison.

An interesting conclusion from the WAW experience was that stakeholder involvement was essential to ensure that the typology was relevant to policy-making. There was, however, no detailed information as to the exact role of stakeholders in the typology-building process. In the steps presented above, the importance of stakeholder involvement is recognized from the outset in the consolidation of types and analysis of results. The appropriate stakeholders must therefore be clearly identified, and methods should be developed to encourage exchanges of information and insights at each stage of the typology-building process. Their inputs will be invaluable in the process of refining national, regional and local types and in fostering debate at the international level.

In this context, lessons can be drawn from: i) REAF, which has a long history of joint work with family farm organizations in the Mercosur countries; ii) the typologies built under INOSYS, where the involvement of local experts was determined by the requirement that they were agents directly involved in the agricultural area of interest; and iii) Brazil, which was one of the first countries to make family farmers an official category that could be targeted for credit or food-security support.

### **Main message – Section 4**

This section proposes the development of an international framework of agricultural typology based on layers and axes to optimize assessments at the global, national and local scales. It draws on lessons from various frameworks, mainly Saravia Matus *et al.* (2013a) Even and Saravia Matus (2014), the IWG-FF typology (Ramos, 2014), RIMISP/IFAD (2014) and IIASA/IFAD (2014).

The axes of analysis are a novel idea in that they are adapted to specific layers of the typology, and they each consider particular aspects. Axis 1 – structure and orientation – enhances the family farming component by expanding the unit of analysis and detailing the livelihoods of agricultural holdings. Axis 2 – production systems and economic size – is based on global typological exercises that focus on farming systems and also assess their production to enhance comparisons. Axis 3 – agro-ecological and social setting – provides a clear context in which to place different types of agricultural holding.

The main challenge is to set up a parallel framework that supports the analysis of agricultural transformations by means of a typology-based tool. The advantages of developing such a framework in alignment with the international typology proposed above are that it would contain international, national and local layers of analysis and it would cover structural, agronomic and socio-economic issues.

# Next Steps and Gap Analysis: Overview of Methodological Challenges

This section details the methodological challenges to be addressed in producing a practical international framework of agricultural typology. They include: i) the acquisition of expertise to ensure accurate use of statistical tools for the identification and description of types in a combined construction approach; ii) a review of statistical practices and methods for the collection, integration and handling of data; and iii) case studies of international agricultural typologies connecting global types with national and local types by means of a combined construction approach, with the associated deductive and statistical methods. This approach requires provision for feedback to improve the identification of types on the basis of local inputs.

Even *et al.* (2014) provides valuable information about challenges and gaps, and possible next steps required to promote international comparability. The seven topics discussed below require further study and technical assistance.

1. Analysis of statistical methods that support the combination of different data sources should focus on the correspondences and gaps between census and household surveys, administrative data and other sources of information. Expert knowledge will be required to support data handling at the country level and to develop methods for incorporating information from a variety of sources such as complementary surveys, interviews, focus groups and agrarian diagnostics.
2. Methodological guidelines are required to explain the combined construction approach. Practitioners developing an international typology that connects with their national and local realities will require sound knowledge of the statistical and other methods that can make use of the nationally available data. There is a need for an overview of the methods involved in each type of approach, the role of subjectivity and objectivity in choosing methods, and assessment the advantages and disadvantages of each method in the light of data constraints. A glossary of the statistical terms required in quantitative exercises for

identification and description of farm types and for the collection, consolidation and handling of data would be an advantage.

3. The descriptive analysis of types can be enhanced by introducing a list of indicators for the upper layers of the international framework. There is a dearth of analytical tools that can be used for the description of farm types, particularly in the layers covering regional and local types: regression analysis, for example, is sometimes used to identify types and sometimes to describe them. Guidelines should be developed on the basis of a review of successful applications of statistical and deductive methods. In Even *et al.* (2014), for example, ANOVA and Duncan tests were frequently used to describe types, but there is a need for assessment of the applicability of these descriptive tools in policy formulation, evaluation and monitoring; information about particular variables at significant times would also be relevant in a dynamic analysis. The descriptive analysis of types could be enhanced by using a template to present results as fully as possible; this is a matter to be decided by each country on the basis of relevance to national policy. Case studies should be conducted to find out how type description can be used in policy evaluation and monitoring work.

4. Establishing long-term monitoring systems is particularly challenging when statistics systems are not adjusted to support dynamic analysis. The literature shows, however, that the challenges can be overcome as new programmes such as AGRIS are implemented to support countries developing integrated census and survey systems. Investigating farm micro-economics and agricultural systems to build farm models for analysis often requires the collection of detailed data and the acquisition of high-level micro-econometric and modelling skills. Because many farms, particularly small and semi-subsistence farms, do not keep records of their operations it is difficult to obtain reliable information. Guidelines should therefore explore monitoring systems involving detailed surveys of small samples based on refined national and sub-national classifications, which should be carried out by extension or advisory service personnel whenever possible.

5. With regard to classification, typology and agricultural transformations, an approach that captures agricultural transformations on the basis of typological findings is required. Changes may be captured at the agricultural holding or type level, or hypothesized from a macro perspective: a method needs to be developed to integrate the information into the framework.

6. In the context of national-level analysis of disaggregated types according to different territories, an approach is needed that enables the accurate

identification of territories so that they can be taken fully into account in analysis. Criteria are needed for the selection and characterization of territories with different transformation patterns or potential transformations. Using mapping tools to show differences in and among territories is challenging because scales and descriptive terms can vary: what is local in the United States, for example, is different from what is local in Nepal.

7. With regard to the effects on policy-making, procedures for full involvement of stakeholders should be developed so that their inputs can influence type formation. The type of stakeholder involved will vary according to whether national, regional or local interests are being considered.

#### ***Main message – Section 5***

A gap analysis will highlight areas where further expertise is required – statistical analysis in the selection of suitable tools, methods and software for the handling of data and identification and description of variables. Improved procedures for the involvement of stakeholders and consideration of their inputs should be developed.

# References

- Agrimonde-Terra Project.** 2014. A method for building scenarios. Available at: <https://www.agrimonde.org/>
- Alary, V., Messad, S., Taché, C. & Tillard, E.** 2002. Approach to the diversity of dairy farm systems in Réunion. *Revue Elev. Méd. Vét. Pays Trop.* 55, 285–297.
- Alvarez, S., Paas, W., Descheemaeker, K., Tittonell, P. & Groot, J.C.J.** 2014. *Constructing Typologies: a Way to Deal with Farm Diversity. General Guidelines for the Humid Tropics.* Report for CGIAR Research Programme on Integrated Systems for the Humid Tropics. Wageningen, The Netherlands, Wageningen University Plant Sciences Group.
- Berdegue, J.A. & Fuentealba, R.** 2011. The state of smallholders in agriculture: Latin America. IFAD conference on New Directions for Smallholder Agriculture. Rome. Italy.
- Bidogeza, J.C., Berentsen, P.B.M., Graaff, J. & Oude Lansink, A.G.J.M. 2009. A typology of farm households for Umutara Province in Rwanda. *Food Security* 1:321–335. DOI: 10.1007/s12571-009-0029-8.
- Blazy, J.-M., Ozier-Lafontaine, H., Doré, T., Thomas, A. & Wery, J.** 2009. A methodological framework that accounts for farm diversity in the prototyping of crop management systems. Application to banana-based systems in Guadeloupe. *Agricultural Systems* 101, 30–41.
- Bosc, P.M., George, H., Even, M.A., Bélieres, J.F. & Loyat, J.** 2012. *Agricultural Transformations: their Diversity and the Challenges they Pose.* Available at: <http://agritrop.cirad.fr/567465/>
- Bourgeois, R., Ekboir, J., Sette, C., Egal, C., Wongtschowski, M. & Baltissen, G.** 2012. *The State of Foresight in Food and Agriculture and the Roads toward Improvement: Part 1 – Foresight Report to GCARD II.* Available at: [www.fao.org/docs/eims/.../State\\_of\\_foresight\\_%20SectionF1\\_Edited%20DO.pdf](http://www.fao.org/docs/eims/.../State_of_foresight_%20SectionF1_Edited%20DO.pdf)
- Brooks, J., Dyer, G. & Taylor, E.** 2008. *Modelling Agricultural Trade and Policy Impacts in Less Developed Countries.* OECD food, agriculture and

fisheries working papers no. 11. Paris, Organization for Economic Co-operation and Development.

**Brooks, J., Dyer, G. & Taylor, E.** 2011a. Modelling the Distributional Implications of Agricultural Policies in Developing Countries: the Development Policy Evaluation Model. OECD food, agriculture and fisheries working papers no. 50. Paris, Organization for Economic Co-operation and Development.

**Brooks, J., Filipski, M., Jonasson, E. & Taylor, J.E.** 2011b. *The Development Policy Evaluation Model: Technical Documentation*. OECD food, agriculture and fisheries working papers no. 51. Paris, Organization for Economic Co-operation and Development.

**Busck, A.** 2002. Farmers' landscape decisions: relationships between farmers' values and landscape practices. *Sociologia Ruralis* 42(3).

**Cassman, K.G., Wood, S., Choo, P.S., Cooper, H.D., Devendra, C., Dixon, J., Gaskell, J., Rattan Lal, S.K., Lipper, L., Pretty, J., Primavera, J., Ramankutty, N., Viglizzo, E. & Wiebe, K.** 2005. Cultivated systems. In: A. Balisacan & P. Gardiner (eds.). *Ecosystems and Human Well-being: Current State and Trends*. The Millennium Ecosystem Assessment series. Washington DC, Island Press.

**Capillon, A.** 1993. *Typologie des exploitations agricoles, contribution à l'étude régionale des problèmes techniques*. Doctoral thesis, Institut National Agronomique Paris-Grignon, Paris.

**Capecchi, V.** 1968. On the definition of typology and classification in sociology. Quality and quantity. *International Journal of Methodology* 2(1):9–30.

**Capecchi, V.** 1966. Typologies in relation to mathematical models. *Ikon* 58 supplement:1–62.

**Council of the European Economic Community (CEEC).** 1965. *Setting up a network for the collection of accountancy data on the incomes and business operation of agricultural holdings in the European Economic Community*. Regulation no. 79/65/EEC. Brussels.

**Chambres d'Agriculture.** 2015. *INOSYS, un dispositif pour connaître les systèmes d'exploitation et accompagner l'innovation.* Available at: <http://www.chambres-agriculture.fr/thematiques/economie/inosys/>

**Chambres d'Agriculture.** 2012. *INOSYS: Regard sur la diversité de l'agriculture française.* Dossier no. 1018. Available at: [http://paris.apca.chambagri.fr/download/presse/RevueCA/1018/1018\\_dossier.pdf](http://paris.apca.chambagri.fr/download/presse/RevueCA/1018/1018_dossier.pdf)

**Chayanov, A.V.** 1966. *The Theory of Peasant Economy.* Homewood, Illinois, University of Wisconsin Press. Translated from the 1920 Russian and German editions.

**CIRAD.** 2013. *Les agricultures familiales du monde.* Montpellier, France.

**CNCR.** 2014. *Libérer le potentiel des exploitations familiales. Analyses paysannes et premières propositions sur la base du suivi de 2,000 exploitations familiales.* Available at: [www.cnrcr.org/sites/default/files/cnrcr\\_rapport\\_suivi\\_des\\_efas.pdf](http://www.cnrcr.org/sites/default/files/cnrcr_rapport_suivi_des_efas.pdf)

**Daskalopoulou, I. & Petrou, A.** 2002. Utilizing a farm typology to identify potential adopters of alternative farming activities in Greek agriculture. *Journal of Rural Studies* 18(9).

**Davidova, S. & Thomson, K.** 2014. *Family Farming: a Europe and Central Asia Perspective.* Background report: Working towards a strategic approach to promote food security and nutrition. Brussels, European Commission.

**Davis, J., Mack, N., Kirke, A.** 1997. New perspectives on farm household incomes. *Journal of Rural Studies* 13:57–64.

**Deheuvels, O. & Penot, E.** 2008. Olympe: a multiscale tool to explore management options in agro-forestry systems. In: B. Rapidel, O. Roupsard & M. Navarro. 2008. *Modelling Agroforestry Systems with Perennial Crops: Connecting Agroforestry Researchers with Modellers.* Catie, Turrialba, Costa Rica.

**Deininger, K. & Byerlee, D.** 2011. *The Rise of Large Farms in Land Abundant Countries: Do They Have A Future?* World Bank Policy Research Working Paper, pp. 1–37. Washington DC.

**Dixon, J., Gulliver, A. & Gibbon, D.** 2001. *Farming Systems and Poverty: Improving Farmers' Livelihoods in a Changing World.* Rome, FAO and World Bank.

**Dorin, B., Hourcade, J.-C. & Benoit-Cattin, M.** 2013. *A World Without Farmers? The Lewis Path Revisited*. CIRED working paper no. 47-2013. Paris, CIRED.

**Emtage, N., Herbohn, J. & Harrison, S.** 2006. Landholder typologies used in the development of natural resource management programmes in Australia – a review. *Australasian Journal of Environmental Management* 13.

**EC.** 2008. Establishing a Community typology for agricultural holdings. Regulation no. 1242/2008. *Official Journal of the European Union*: L 335/3. Brussels.

**EC.** 1985. *Decision of 7 June 1985: Establishing a Community typology for agricultural holdings*. Brussels.

**EC.** 1980. *Decision of 15 December 1980 amending decision 78/463/EEC establishing a community typology for agricultural holdings*. Brussels.

**Even, M.A. & Saravia Matus, S.** 2014. *Implementation of WAW International Typology: Synthesis Report on Seven National Case Studies (Argentina, Brazil, France, Madagascar, Malawi, Nicaragua, Vietnam)*. Rome, FAO, WAW.

**Ewert, F., Van Ittersum, M.K., Heckelei, T., Therond, O., Bezlepkin, I. & Andersen, E.** 2011. Scale changes and model linking methods for integrated assessment of agri-environmental systems. *Agriculture, Ecosystems and Environment* 142:6–17.

**Falconnier, G., Descheemaeker, K., Van Mourik, T.A., Sanogo, O.M. & Giller, K.E.** 2015. *Two Decades of Change in Southern Mali: Understanding Farm Trajectories and Development Pathways*. Available at: <http://www.africanuances.nl/content/understanding-farm-trajectories-and-development-pathways-two-decades-change-southern-mali>

**Fan, S., Brzeska, J., Keyzer, M. & Hulsema, A.** 2013. *From Subsistence to Profit: Transforming Smallholder Farms*. Washington DC. Available at: <http://www.ifpri.org/publication/subsistence-profit-transforming-smallholder-farms>

**FAO.** 2015. World Programme for the Census of Agriculture 2020. Rome. Available at: <http://www.fao.org/economic/ess/ess-wca/wca-2020/en/>

**FAO.** 2014a. *Understanding Smallholder Farmer Attitudes to Commercialization: The case of Maize in Kenya*. A. Woolverton & D. Neven (eds.). Rome.

**FAO.** 2014b. *Rural Livelihood Monitor*. Available at: <http://www.fao.org/3/a-at887e.pdf>

**FAO.** 2005. *A System of Integrated Agricultural Censuses and Surveys*. Vol. 1. *World Programme for the Census of Agriculture 2010*. Rome, Italy.

**FAO.** 1999. *Guidelines for Agrarian System Diagnosis*. Land Tenure Service. Rome.

**Garner, E. & De la O Campos, A.P.** 2014. Identifying the “family farm”: an informal discussion of the concepts and definitions. ESA working paper no. 14-10. Rome, FAO.

**Gennari,P., Duhamel,C. & Fonteneau. F.** 2015. *Agricultural Integrated Survey (AGRIS) Rationale: Methodology and Implementation*. Rome, FAO.

**George, H., Bosc, P-M., Even, M-A., Belières, J-F. & Bessou, C.** 2012. *WAW proposed methodological framework to monitor agricultural structural transformations and their contributions to sustainable development*. Aarhus, Denmark, WAW Secretariat and CIRAD.

**Giller, K.E., Tittonell, P., Rufino, M.C., van Wijk, M.T., Zingore, S., Mapfumo, P., Adjei-Nsiah, S., Herrero, M., Chikowo, R., Corbeels, M., Rowe, E.C., Baijukya, F., Mwijage, A., Smith, J., Yeboah, E., Van der Burg, W.J., Sanogo, O.M., Misiko, M., de Ridder, N., Karanja, S., Kaizzi, C., K’ungu, J., Mwale, M., Nwaga, D., Pacini, C. & Vanlauwe, B.** 2011. Communicating complexity: Integrated assessment of trade-offs concerning soil fertility management within African farming systems to support innovation and development. *Agricultural Systems* 104:191–203.

**Guanziroli, C., Buainain, A. & Sabbato, A.** 2013. Family farming in Brazil: evolution between the 1996 and 2006 agricultural censuses. *Journal of Peasant Studies* 40(5):817–843, DOI: 10.1080/03066150.2013.857179

**Hair, J.F., Black, W.C., Babin, B.J. & Anderson, R.E.** 2010. *Multivariate Data Analysis: A Global Perspective*. Seventh edition. Cambridge, UK, Pearson.

**Hazell, P. & Wood, S.** 2008. Drivers of change in global agriculture. *Philosophical Transactions of the Royal Society of London*. 363(1491):495–515.

**Hazell, P. & Rahman, A. (eds.)** 2014. *New Directions for Smallholder Agriculture*. Oxford, UK, Oxford University Press.

**Hervé, M.** 2011. *Aide-mémoire de statistique appliquée à la biologie – Construire son étude et analyser les résultats à l'aide du logiciel R*. 2<sup>nd</sup> edition. Available at: <http://www.idg.pl/mirrors/CRAN/doc/contrib/Herve-Aide-memoire-statistique.pdf>

**HLPE.** 2013. Investing in Smallholder Agriculture for Food Security. Committee on World Food Security policy recommendation. Available at: <http://www.fao.org/3/a-av034e.pdf>

**Howden, P. & Vanclay, F.** 2000. The mythologization of farming styles in Australian broadacre cropping. *Rural Sociology* 65(2):295–310.

**Howden, P., Vanclay, F. Lemerie, D. & Kent, J.** 1998. Working with the grain: Farming styles amongst Australian broadacre croppers. *Rural Society* 8(2):109–127.

**Howe, G. & McKay, A.** 2007. Combining quantitative and qualitative methods in assessing chronic poverty: the case of Rwanda. *World Development* 35:197–211.

**IIASA/IFAD.** 2014. *Project Monitoring and Policy Scenarios Programme*. Deliverable 2. Prepared by G. Bocquého, A. Mosnier, T. Elhaut & P. Havlík. Laxenburg, Austria and Rome.

**Iraizoz, B., Gorton, M. & Davidova, S.** 2007. Segmenting farms for analysing agricultural trajectories: a case study of the Navarra region in Spain. *Agricultural Systems* 93(1–3):143–169.

**Jousseins, C., Fagon, J., Belvèze, J. & Servière, J.** 2011. Livestock Farm Networks: a system at the centre of French farming development. Paper presented at the 9<sup>th</sup> International Rangeland Congress workshop on livestock farming embedded in local development. Rosario, Argentina

**Jouve, P. & Tallec, M.** 1996. *Une méthode d'étude des systèmes agraires en Afrique de l'Ouest par l'analyse de la diversité et de la dynamique des*

*agrosystèmes villageois*. Available at:  
[http://www.biw.kuleuven.be/aee/clo/idessa\\_files/jouve1996.pdf](http://www.biw.kuleuven.be/aee/clo/idessa_files/jouve1996.pdf)

**Kebede, B.** 2007. Community wealth-ranking and household surveys: an integrative approach. QSquared working paper no. 38. Toronto, Canada, University of Toronto Centre for International Studies.  
Kobrich, C., Rehman, T. & Khan, M. 2003. Typification of farming systems for constructing representative farm models: two illustrations of the application of multi-variate analyses in Chile and Pakistan. *Agricultural Systems* 76:141–157.

**Kostrowicki, J.** 1992. Types of agricultural maps in Europe. In: Mohamed, N. 1992. *New Dimensions in Agricultural Geography: Historical Dimensions of Agriculture*. ISBN 8170224012, 9788170224013.

**Kostrowicki, J.** 1989. Types of agriculture in Britain in the light of the types of the Agriculture Map of Europe. *Geographia Polonica* 65:133–154

**Kostrowicki, J.** 1986. *Transformations de l'agriculture européenne à la lumière de la carte des types agricoles de l'Europe*. *Geographia Polonica* 52:191–208.

**Kostrowicki, J.** 1984. Types of agriculture in Europe: a preliminary outline. *Geographia Polonica* 50:131–150.

**Kostrowicki, J.** 1982. The types of agriculture map of Europe. *Geographia Polonica* 48:79–92.

**Kostrowicki, J.** 1980. A hierarchy of world types of agriculture. *Geographia Polonica* 43:125–148.

**Kostrowicki, J.** 1979. Twelve years' activity of the IGU Commission on Agricultural Typology. *Geographia Polonica* 40:235–253.

**Kostrowicki, J.** 1977. Agricultural typology concept and method. *Agricultural Systems* 2:33–45.

**Kostrowicki, J.** 1970. Agricultural typology. Summary of activity of the IGU Commission for the years 1964–1968. *Geographia Polonica* 19:11–30.

**Kostrowicki, J.** 1968. Agricultural typology. Agricultural regionalization. Agricultural development. *Geographia Polonica* 14:265–274.

**Kostrowicki, J.** 1964. Geographical typology of agriculture. Principles and methods. An invitation to discussion. *Geographia Polonica* 2:159–168.

**Landais, E.** 1998. Modelling farm diversity: new approaches to typology building in France. *Agricultural Systems* 58(4):505–527.

**Lazarsfeld, P.F & Barton, A.H.** 1951. Qualitative measurement in the social sciences: classifications, typologies and indices. In: D. Lerner & H. D. Lasswell (eds.). 1951. *The Policy Sciences*. Stanford, CA, USA, Stanford University Press.

**Laurent, C., van Rooyen, C.J., Madikizela, P., Bonnal, P. & Carstens, J.** 1999. Household typology for relating social diversity and technical change. *Agricultural Economics Research, Policy and Practice in Southern Africa* 38(S1):190–208.

**Longhitano, D., Bodini, A., Povellato, A. & Scardera, A.** 2012. Assessing farm sustainability. An application with the Italian FADN sample. First AIEAA conference. Trento, Italy.

**Lopes Soares, W. & Helfand, S.** 2013. Typology of farmers in the context of the preparation of the national sample surveys of agricultural establishments. ICAS IV. Rio de Janeiro.

**Losch B., Fréguin Gresh S. & White, E.T.** 2012. *Structural Transformation and Rural Change Revisited: Challenges for Late Developing Countries in a Globalizing World*. Africa Development Forum Series. World Bank and Agence Française de Développement. ISBN: 978-0-8213-9512-7.

**Louhichi, K. & Gomez y Paloma, S.** 2014. A farm household model for agri-food policy analysis in developing countries: application to smallholder farmers in Sierra Leone. *Food Policy* 45(0):1–13.

**Marradi, A.** 1990. Classification, typology, taxonomy. *Quality and Quantity* XXIV(2):129–157.

**May, R.W.** 1982. Discriminant analysis in cluster analysis. In: H.C. Hudson (ed.). 1982. *Classifying Social Data*. San Francisco, Jossey-Bass.

**Mazoyer, M. & Roudart, L.** 2006. *A History of World Agriculture. From the Neolithic Age to the Current Crisis*. London, Earthscan.

**Mbétid-Bessane, E., Havard, M., Djamen Nana, P., Djonnewa,A., Djondang, K. & Leroy, J.** 2003. *Typologies des exploitations agricoles dans les savanes d'Afrique centrale. Un regard sur les méthodes utilisées et leur utilité pour la recherche et le développement. Savanes africaines: des espaces en mutation, des acteurs face à de nouveaux défis.* Conference proceedings. Garoua, Cameroun; N'Djamena, Chad; Montpellier, France, CIRAD.

**Michielsens, C.G.J., Lorenzen, K., Phillips, M.J. & Gauthier, R.** 2002. Asian carp farming systems: towards a typology and increased resource use efficiency. *Aquaculture Research* 33:403–413.

**Nagelschmitz, K., Esqueda, A., Hernandez Ramos, H., Esteves Cano, L.F. & Ahearn, M.** 2013. Farm classification systems for North American agriculture. ICAS VI. Rio de Janeiro.

**OECD.** 2006a. *Agricultural Policy and Trade reforms: Potential Effects at Global, National and Household Levels.* J. Dewbre & J. Brooks (eds.). Paris.

**OECD.** 2006b. Promoting pro-poor growth: agriculture. In: Otte, M.J. & Chilonda, P. 2002. *Cattle and Small Ruminant Production.* Paris.

**Ouedraogo, E. & Nayon A.M.** 2013. Agricultural holdings typology construction using agricultural census data: what typology and what variables to be selected for robust typology? ICAS VI. Rio de Janeiro.

**Pacini, G.C., Colucci, D., Baudron, F., Righi, E., Corbeels, M., Tittonell, P. & Stefanini, F.M.** 2013. Combining multi-dimensional scaling and cluster analysis to describe the diversity of the rural households. *Experimental Agriculture FirstView* pp. 1–22.

**Penot, E., Le Bars, M., Deheuvels, O., Le Grusse, P. & Attonaty, J.M.** 2014. *Farming System Modelling in Tropical Agriculture using the Olympe Software.* Paris, CIRAD.

**Pingali, P.L. & Rosegrant, M.W.** 1995. Agricultural commercialization and diversification: processes and policies. *Food Policy* 20(3):171–185.

**Ramos, A.** 2014. Compilation of the definitions and methodologies commonly used and accepted at a national, regional and international level to define and describe family farming based on its diversity. Final Report of IWG FF. Rome.

**REAF-Mercosur.** 2010. *La RAEF y el Reconocimiento de la Agricultura Familiar en el Mercosur*. Montevideo.

**Righi, E., Dogliotti, S., Stefanini, F.M., Pacini, G.C.** 2011. Capturing farm diversity at regional level to up-scale farm level impact assessment of sustainable development options. *Agriculture, Ecosystems and Environment* 142:63–74.

**RIMISP-IFAD.** 2014. Family farming in Latin America. A new comparative analysis. Synthesis report. Mexico City and Rome.

**Rueff, C., Choisis, J.P., Balent, G., Gibon, A.** 2012. A preliminary assessment of the local diversity of family farms' change trajectories since 1950 in a Pyrenees mountain area. *Journal of Sustainable Agriculture* 36(5).

**Sanogo, O.M., de Ridder, N. & van Keulen, H.** 2010. *Diversité et dynamique des exploitations agricoles mixtes agriculture-élevage sud du Mali*. Cahier Agriculture 19:185–193.

**Saravia Matus, S. & Gomez y Paloma, S.** 2014. Farm viability of (semi)subsistence smallholders in Sierra Leone. *African Journal of Agricultural and Resource Economics* 9(3):165–182.

**Saravia Matus, S., Cimpoies, D. & Ronzon, T.** 2013a. *Typology and Indicators to Characterize Agricultural Holdings for Improved Policy Formulation*. Rome, FAO, WAW.

**Saravia Matus, S., Délincé, J. and Gomez y Paloma, S.** 2013b. *Overview of Large Scale Land Transactions in the context of Food Security*. European Commission JRC Technical Report. Brussels.

**Scheinkeman de Obschatko, E.** 2009. *Las explotaciones agropecuarias familiares en la Republica Argentina. Un análisis a partir de os datos del Censo Nacional Agropecuario 2002 PROINDER*. Study paper no. 23. Buenos Aires.

**Seré, C. & Steinfeld, H.** 1996. *World Livestock Production Systems: Current Status, Issues and Trends*. FAO Animal Production and Health Paper no. 127. Rome.

**South African Department of Rural Development and Land Reform.** 2009. *The Comprehensive Rural Development Programme Framework*. Pretoria.

Steinfeld, H., Wassenaar, T. & Jutzi, S. 2006. Livestock production systems in developing countries: status, drivers, trends. *Review of Science and Technology* 25(2):505–516.

**Tittonell, P.** 2014. Livelihood strategies, resilience and transformability in African agro-ecosystems. *Agricultural Systems*: 126:3–14.

**Tittonell, P., Muriuki, A., Shepherd, K.D., Mugendi, D., Kaizzi, K.C., Okeyo, J., Verchot, L., Coe, R. & Vanlauwe, B.** 2010. The diversity of rural livelihoods and their influence on soil fertility in agricultural systems of East Africa:- a typology of smallholder farms. *Agricultural Systems* 103(2):83–97.

**Tittonell, P., Vanlauwe, B., Leffelaar, P.A., Shepherd, K.D. & Giller, K.E.** 2005. Exploring diversity in soil fertility management of smallholder farms in western Kenya. II. Within-farm variability in resource allocation, nutrient flows and soil fertility status. *Agriculture, Ecosystems and Environment* 110:166–184.

**Toulmin, C. & Guèye, B.** 2003. *Transformations de l'agriculture ouest-africaine et rôle des exploitations familiales*. Report no. 123. Dakar. International Institute for Environment and Development.

**USDA.** 2013. *Updating the ERS Farm Typology*. Washington DC.

**Valbuena, D., Groot, J., Mukalama, J., Gérard, B. & Tittonell, P.** 2014. Improving rural livelihoods as a “moving target”: trajectories of change in smallholder farming systems of Western Kenya. *Regional Environmental Change* 15, pp 1–13.

**Valbuena, D., Verburg, P.H. & Bregt, A.K.** 2008. A method to define a typology for agent-based analysis in regional land-use research. *Agriculture, Ecosystems and Environment* 128:27–36.

**Vanclay, F., Mesiti, L. & Howden, P.** 1998. Styles of farming and farming sub-cultures: Appropriate concepts for Australian rural sociology? *Rural Society* 8(2):85–108.

**Whatmore, S.** 1994. Farm household strategies and styles of farming: Assessing the utility of farm typologies. In: J.D. van de Ploeg & A. Long (eds.). 1995. *Born From Within: Practice and Perspectives of Endogenous Rural Development*, pp. 31–37. Assen, Netherlands, Van Gorcum.

**World Bank.** 2007. *World Development Report 2008: Agriculture for Development*. Washington DC.

**Wye City Group.** 2011. *Wye Group Report on Statistics on Rural Development and Agricultural Household Income*. Rome, FAO.

# Annex

## Annex 1: IGU Typological Procedures

For every agricultural holding unit under study the identification variable values were transformed into 28-digit codes representing classes (0 – 5) of world ranges. Box 16 presents the thresholds used in each of the 27 identification variables of agricultural holdings.

**Box 16. Classes of world ranges of identification variables and related thresholds**

No. of the variable	Classes				
	1 very low	2 low	3 medium	4 high	5 very high
1	– 20	20–40	40–60	60–80	80–
2	– 20	20–40	40–60	60–80	80–
3	– 20	20–40	40–60	60–80	80–
4	– 20	20–40	40–60	60–80	80–
5	– 2	2–8	8–50	50–200	200–
6	– 5	5–20	20–100	100–1000	1000–
7	–100	100–1000	1000–10 000	10 000–100 000	100 000–
8	– 3	3–15	15–40	40–150	150–
9	– 2	2–8	8–15	15–30	30–
10	– 6	6–15	15–35	35–90	90–
11	– 10	10–30	30–80	80–200	200–
12	– 10	10–25	25–50	50–80	80–
13	– 10	10–30	30–70	70–130	130–
14	– 10	10–30	30–80	80–160	160–
15	– 5	5–20	20–45	45–100	100–
16	– 5	5–20	20–45	45–100	100–
17	– 40	40–100	100–250	250–800	800–
18	– 20	20–60	60–180	180–600	600–
19	– 20	20–40	40–60	60–80	80–
20	– 3	3–12	12–30	30–80	80–
21	– 0.1	0.1–0.2	0.2–0.4	0.4–0.8	0.8–
22	– 10	10–20	20–40	40–60	60–
23	– 20	20–40	40–60	60–80	80–
24	– 20	20–40	40–60	60–80	80–
25	– 20	20–40	40–60	60–80	80–
26	– 20	20–40	40–60	60–80	80–
27	– 20	20–40	40–60	60–80	80–

About 1,000 cases from various parts of the world were analysed by means of these codes. The preliminary multi-level classification of world agriculture resulted in six types of the first order, about 30 types of the second order and over 100 types of the third order (Kostrowicki 1980). The six types of the first order were: i) traditional extensive (primeval) agriculture (E); ii) traditional large-scale (latifundia) agriculture (L); iii) traditional small-scale (peasant) agriculture (T); iv) market-oriented agriculture (M); v) socialized agriculture (S); and vi) highly specialized commercial livestock breeding (A). Each has a

number of types of the second and third orders (Kostrowicki, 1984). The name of each type is based on its most obvious characteristics, and a symbol is assigned – a capital letter for first-order types a capital and a lower-case letter for the second order types, and a capital and two lower-case letters for the third order types, usually derived from their characteristics – E(e) for “extensive”, T for “traditional”, lower-case l for “large-scale” and i for “intensive” and so on (Kostrowicki 1984) Box 9 shows examples of types for each order. The type codes were assigned in the 1980s, and those designating types such as “socialized” agriculture are now extinct in Europe.

Kostrowicki (1984) stated that the codes for every basic unit of interest were compared electronically with the model codes for the types of the three orders. Where the investigated units did not differ from the model codes by more than the arbitrarily adopted minimum of deviations – 11 or 1/10 of possible variance for third order types, 22 or 2/10 for second order types and 33 or 3/10 for first order types – they were considered as the same type. Units that exceeded the adopted maximum were grouped according to similarity and described as new types. This constituted a data-driven approach to defining types, but there were many cases when the distance between the code of the investigated unit and two or more model codes was smaller than the adopted minimum: in such cases the unit was treated as transitional between two or more types.<sup>33</sup>

---

<sup>33</sup> The degree of transition was measured by means of the successive products technique (Kostrowicki 1976; Tyszkiewicz 1980; Stola 1983) with no more than 4 products involved (e.g. the transition between two types could be 3:1, 2:2 or 1:3). When the distance between the investigated unit and one model code was large though still below the adopted maximum, at the same time with the other model code slightly above that limit, but by no more than 25 per cent of the distance between the former and the model code, the "25 per cent tolerance clause" was introduced that made it possible to take such distances into account. In fact, this applies only to the cases when the distance between the unit and one model code is more than 9 and less than 14 from another model code ( $10+0.25 \times 10 = 12.5$ ;  $11+0.25 \times 11 = 13.7$ ). There are some cases, however, when the codes for some internally very diversified units exceed the adopted limit and cannot be grouped in any sensible way into new types. Then, some greater tolerance ought to be shown, if closer investigation of a given unit proves that several types of a very different character occur there side by side.