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The setting up of Farm Register: the production process to building up the prototype of the pre-census list

Abstract

In the last months Istat is undertaking a complex project in the field of agricultural statistics: to build up the farm register. The need to enlarge the already implemented system of business registers on the primary sector is also demanded by European regulations. Moreover next Census on agricultural holdings planned for 2010 asks the support of a list to be used in that survey. Then a prototype of pre-census list has been produced and a survey for checking its coverage and quality has been set up. This list is the result of the integration of administrative sources gathering different kind of information on the agricultural sector. As records originate from various administrative files (different units definitions, concepts, coverage, etc.) problems of identification of potential farms, whether they are representing an actual operating farm, how agricultural area for farming is significantly high to be taken into consideration have been faced. On the other side results of the ongoing survey aiming at assessing the goodness of the prototype of list, will be very useful to adjust, when necessary, and to improve a good statistical model for the setting up of the complete list to be used as a support for the 2010 Census of Agriculture.

This paper will describe the main steps carried out to obtain the pre-census prototype of list: a description of the administrative sources used as input, problems in implementing the definition of agricultural holding, methods for the treatment of data, matching problems, etc. Then a brief description of the quality survey to assess the list will underline difficulties encountered in planning and organizing a survey following a different approach with respect to all the previous surveys carried out in the agricultural field.

Introduction

In recent time Istat focused its attention on the feasibility study to set up and update a register of units operating in the agricultural sector starting from the available information in administrative files. The purpose is mainly to retrace the process that allowed the realization of the business register ASIA that covers all active enterprises (without any size limit), obtained from a process of integration of administrative files, where statistical methodologies have been developed to estimate and impute characteristics, yearly updated. The need to enlarge the statistical register system to the sector of agriculture arises from different needs. On the one hand constraints come from the new European Regulations in theme of business register¹ and on farm structure surveys (FSS)² that defines the general framework concerning the Census of Agriculture 2010 carrying out. On the other hand there is a growing demand towards more updated information than the one a Census can produce as well as a frame yearly updated is desirable as a reference list for any survey producing agricultural statistics. In particular planning for the 2010 Census of Agriculture introduced some strategic choices aimed to confirm or not the traditional approach to the ten-years survey.

Innovations concern different aspects of the census survey: universe of reference, coverage, classification system, survey technique, organizational factors. To fulfil such innovations there are two main constrains: 1)

¹ **REGULATION (CE) N. 177/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 20 February 2008 on a common framework for business register that abrogates the regulation (CEE) n. 2186/93 of the Council**

² **REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on farm structure surveys and the survey on agricultural production methods and repealing Council Regulation (EEC) No 571/88**

to comply with the FSS regulation; 2) to rely on a list to be used to support the survey. This second aspect implies the existence of a high-quality register of agricultural holdings (the Farm Register) in terms of coverage and of other attributes of units required for the stratification of sample surveys. According to such innovations Census is going to be carried out as a survey strongly list-assisted as that list will be: a frame to apply the minimum physical threshold at NUTS2 level ex-ante to exclude some units from survey; a frame for the sampling survey design; useful to pre-print some basic information on the questionnaire; the support to assist data collectors. The project aiming at the realization of the Farm register is organized into five phases: Phase 1: the realization of a prototype-list resulting from the integration of administrative sources covering the agricultural sector.

Phase 2: the test of adopted integration methodologies, of the units identification criteria, of the goodness of administrative variables through a quality sample survey.

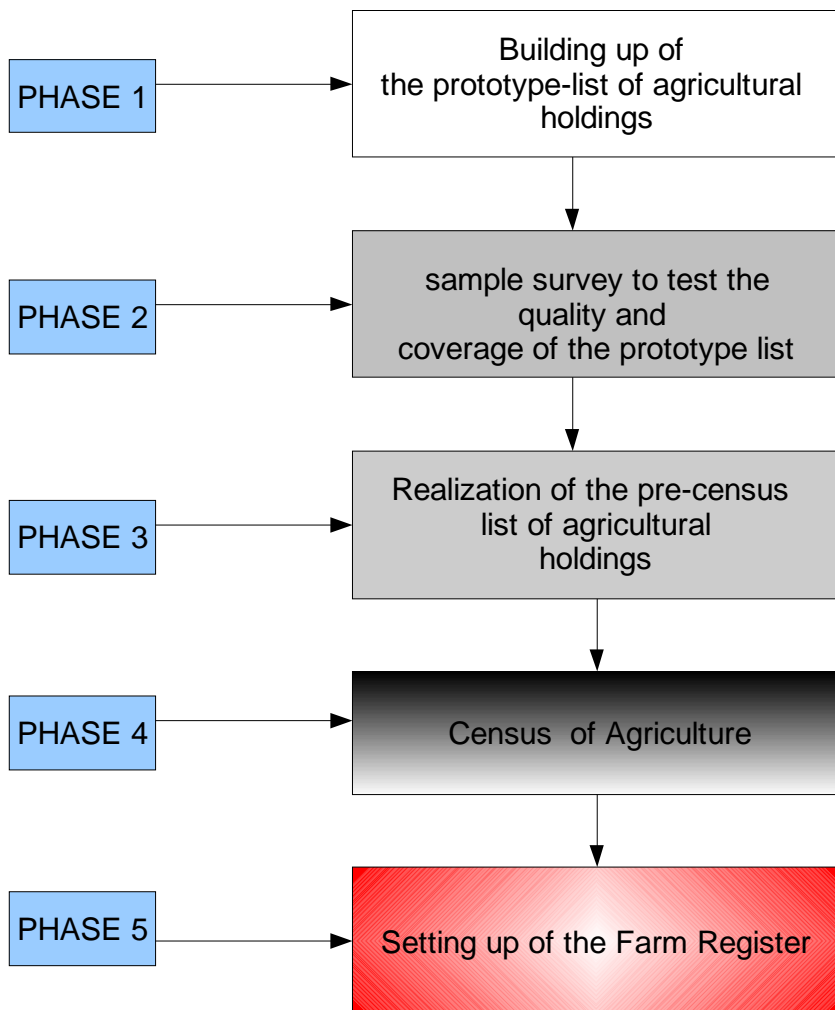
Phase 3: the revising of adopted methodologies on the basis of the survey results and a re-conciliation with data of the prototype-list in order to obtain the final version of the list of agricultural holdings to be investigated by the 2010 Census.

Phase 4: the Census of Agriculture.

Phase 5: the building up of the Farm Register using the results of the Census as a benchmark.

The present work focuses on the first two phases of this project; in particular with regards to the setting up of the prototype-list the main different steps of the pre-treatment of input sources and matching records are described; then a brief description of the main purposes of the planned survey to check quality and coverage of the prototype-list is done.

Picture 1 –Phases of the project for the realization of the Farm register



The use of administrative sources for the agricultural sector

The production process of the acquiring, treatment and integration of administrative sources with regards to the agricultural sector poses some difficulties to face, partly due to the sector itself and to peculiarities of the available sources of information. Some issues of complexity are the following:

- a) the sector – agricultural sector is characterized by small and very small productive units, strongly aided for the realization of a minimum income. Labour force is mainly based on family labour, often seasonal and part-time. Moreover the sector is strictly integrated with other activities such as transformation, trade, tourism, etc. These items make complex the correct identification of units as well as the estimation of their actual size and their principal activity;
- b) definition of units – At national level as defined by the Census of Agriculture and according to the definition of the FSS regulation (article2), the statistical definition of “Agricultural holding” means a *single unit, both technically and economically, constituted by lands, even not contiguous, and by machineries managed by a holder i.e. natural or juridical person or institution which undertakes agricultural, forestall and zootechnics activities.* On the other side each administrative body has its own function to collect data and manage the corresponding records, under specific legislation governing relations between them and individuals and between them and the public administration. Thus, each source uses peculiar definitions and classifications that need to be translated according to a statistical framework before their usage. The main difficulty is to identify easily the statistical unit of reference starting from the units recorded into administrative files;
- c) problem with sources – there is a lack of a unique benchmark or pivot archive that covers the whole potential universe of agricultural holdings. The most useful sources gather information for different purposes such as: the payment of community contributions (AGEA); the identification and registration of animals for public health reason (AA.ZZ.); the income declaration for tax reasons. Even recorded variables in each source can present a different degree of complexity in the statistical translation. For example even if the agricultural area utilized for farming is declared and recorded by a source it can be calculated only for some categories of products or it is declared only the part liable for payment. Moreover, with regards to labour dimension it can be complex to calculate the number of equivalent full-time working days of farm work when the person is also involved in other working activities.

The prototype-list called the “Integrated Base of Administrative Sources” (BIFA), has been obtained by the integration of administrative sources which contain information concerning the agricultural world and its units. Some sources are specific for the agricultural sector while others have a more general nature as they collect information on different productive sectors too (like the Chamber of Commerce).

Sectoral sources are: the Integrated Administration and Control System³ (AGEA), the System for the Identification and Registration of Bovine Animals and other species (AA.ZZ.), lands’ property Incomes (Tax Agency), the Land registry, Agricultural self-employed workers (Social Security), regional agricultural Systems.

General sources are: the Chambers of Commerce, the VAT declarations (Tax Agency), the 2000 Census of Agriculture, the Business Register.

The administrative sources: contents, potentiality and limits

The Integrated Administration and Control System – AGEA

The database managed by AGEA i.e. the Italian Paying Agency has been set up in accordance with the EC n. 885/2006 that, under the common agricultural policy, acts in the coordination and execution of payments to support farmers. The Integrated Administration and Control System has been realized in order to record, verify and control data. The core of this system is made of files containing information on data that each agricultural holding is obliged to present for any aid application. That file (called “*fascicolo aziendale*”) is constituted the first time a request of premium is presented, then information must be taken updated on the basis of the following yearly requests of aid. The file’s content concerns information to be recorded in the integrated system and based on some definitions:

³ **COUNCIL REGULATION (EC) No 1782/2003 of 29 September 2003 establishing common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers**

(a) 'farmer' means a natural or legal person, or a group of natural or legal persons whose holding is situated within the Community territory and who exercises an agricultural activity,

(b) 'holding' means all the production units managed by a farmer situated within the territory of the Member State

(c) 'agricultural activity' means the production, rearing or growing of agricultural products including harvesting, milking, breeding animals and keeping animals for farming purposes, or maintaining the land in good agricultural and environmental condition.

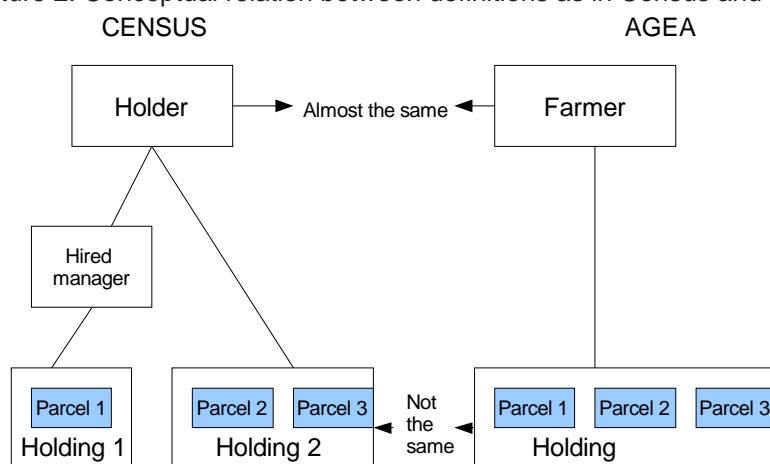
In the database there are many available information; they can be divided into two main groups:

1) identification data of the farmer or the agricultural holding: Unique Code of Agricultural Holdings (CUAA code) that corresponds to the fiscal code of the holder. The CUAA code is mandatory whenever a relation with the Public Administration is undertaken. Holder's name, permanent address or place of residence, VAT number if present. Dates of inscription and updating.

2) territorial data: agricultural parcels of the holding (in theory all the managed parcels and not only all the ones corresponding to the eligible hectare accompanying any payment entitlement); information on the use of each parcel (crops, livestock); hectares invested by type of product (cadastral area and agricultural area utilized for farming). Moreover in the case the farmer that manages the agricultural holding is not the owner of parcels it is recorded the identification code of landholders and the type of contract that links farmer to landholder.

AGEA data are of primary importance especially to estimate the agricultural area by crops and to locate farms on the territory. A big advantage is the presence of a unique ID code (CUAA) that identifies the holding and that solves problems of links with different sources having a system of units identification based on fiscal codes. However this source presents some limits in definitions and in coverage. As regards definition let compare the statistical definition adopted in Census with the AGEA definition (Picture 2)

Picture 2: Conceptual relation between definitions as in Census and in AGEA



Although from the conceptual comparison there does not seem to be much difference at units identification level, the introduction of "hired manager"- identified by the Census as that person managing in practice the holding even if the holder maintains the control - can cause discrepancies. Problems due to the presence of this figure can affect linkage results between Census data and administrative ones.

Even coverage is partial, both in terms of recorded crops (there are no aids for some growing crops like orchards) or/and in terms of units, in fact it is possible that not all the holders ask for an aid.

The land's property income

The database managed by the Tax Agency represents an important huge source of information covering in theory anybody owns a land. In facts it covers those tax payers that for a given tax year declare an income because of landlord's rights and/or agricultural activities are carried out and/or livestock farming and/or farm holidays. This source is made up of different files. There are four models taxpayers have to fill in according to their juridical status (Table 1): 1) natural persons, main section on agricultural income i.e. an income

coming from any agricultural activity carried out on lands, or/and income coming from the landlords' rights, and/or income for livestock farming; 2) Simple partnership 3) non profit institutions 4) earned income files. Apart the agricultural income they declare, taxpayers belonging to the natural persons group have to compile additional sections. One of the most interesting section concerns dependent relatives i.e. the declarant (identified by its fiscal code) indicates the identification code (the fiscal code) of each relative and the family relationship. Generally, crossed declarations are founded between husband and wife and/or between father (mother) and children. Although this declaration is done only for tax reasons (tax allowance) a useful information about family relationships and links can be derived, especially with regards to a reality where agricultural holdings are typically made up of an agricultural family based structure. Another interesting section in the model concerns the information on the participation of declarant into other individual or partnerships units. This information is available from the participated firm or holder side as it declares the fiscal code of its collaborator or coadjutant and from the declarant or collaborator side as he/she declares the fiscal code of the participated firm or holding.

Table 1 – Declaration models and their sections (Tax Agency)

Type of model	main section	other sections
Natural persons	income from agricultural activities, landlords' rights livestocks	1. participation in partnerships or others 2. dependent relatives
Simple partnerships	income from agricultural activities, landlords' rights	
Non profit institutions	holiday farm	
Income earned by employees, retired persons	agricultural income, by declarant and his spouse	

Even if this source has big potentiality it presents coverage problems. With regards to units there is an under-coverage in fact, all different forms of organization, like limited liability companies or cooperative, are not included in this universe as they produce business income (so they have to fill in different models). Moreover, because of a very big difference in terms of unit definition in comparison to the statistical one, more than one administrative unit can represent only one agricultural holding and therefore an over-coverage is predictable. For example both the owner and the tenant of the same land have to make tax declaration as well as two or more co-landowners but only one is the holder according to the statistical rule. Some useful variables are available such as: all identification information on taxpayer (fiscal address, name), property title, percentage of property, amount of income, id codes to link declarations pertaining different taxpayers that indicate the existence of reciprocal relationship.

The System for the Identification and Registration of Bovine Animals and other species (AA.ZZ.)

The AA.ZZ. registers are managed by the Ministry of Welfare. Recorded units concern animals and their holders with the scope to preserve public welfare. The covered animal species are bovines, pigs, sheep and goats, poultry, equines. The national database of Bovine Animals realized in accordance with the EC n. 1760/2000 for the setting up of a System for the Identification and Registration of Bovine Animals, is the only fully operative register up to date. With regards to sheep and goats the existing regulation (EC n. 21/2004) to set up a register is not yet fully operative, while with regards to the others species no regulations have been set up and information is available only on holders' identification characters. Then as bovines are well covered both in terms of livestock holdings and number of units (monthly time series of bovine animals are available) some of other registers have yearly data on the number of animals, others have no information at all, therefore coverage is not assured.

Land Registry

This register contains information on parcels, their owners and ownership's title. Due to the huge amount of records, data are organized in various files and by municipality: a) parcels referring to land b) ownership's titles and c) owners. The linkage among these three files is assured by a set of codes. Among the enormous variety of information the most significant ones for parcels are: parcel identification codes, parcel characteristics like soil quality (i.e. land devoted to vineyard or sowable ground), hectare, estimated agricultural income. As the administrative unit is the land (the parcel) over-coverage problems can be

determined by the correct and updated use of that land. According to the soil quality codes a cut off is possible in order to identify parcels having agricultural uses only, of course quality of this information is not very well known. Another set of useful information is about ownership's titles such as the land's rights (property, usufruct), property share and property settlement. Titles represent the link between the owner and its property. The owner can be a natural person (associated identification variables are name, surname, sex, birth date, fiscal code) and juridical person.

Land registry, in theory, guarantees the absence of under-coverage in terms of lands.

The agricultural self-employed workers

The Social Security collects data on agricultural self-employed workers and in particular on farmers and agricultural entrepreneurs. Declarations are made for contribution reasons. This register covers information on farmers (name, the holder's fiscal code) and on family members working in the farm (working days, fiscal code). The importance of the register lies in supplying information on labour force of holdings.

The Regional Agricultural Systems

According to regional legislations and habits, some Regions build up, manage and update their own administrative agricultural system. Databases are mainly based upon the integration of AGEA data, available at regional level thanks to the legislation that allows some regions to carry out functions of decentralized Paying Agency. The value added given by their database is sometimes high. In fact there is a higher coverage in terms of units due to the integration of different sectoral archives not supplied at the moment by the AGEA source; more accurate and updated information thanks to a direct check on the territory; and more detailed specifications on growing. Moreover the developing of a cooperation is desirable even if the integration of several, different organized databases into the production process determines a further cost.

Added sources are the **Chambers of Commerce** having selected only those units carrying out an agricultural economic activity, principal or secondary (section A- B of Nace rev1.1) and **VAT** declared by units having a VAT code to carry out agricultural activity too. These sources cover mostly business units and an overlapping between the farm register and the business register can be possible.

The integration process

Summarizing the characteristics of each administrative source that will be used in input of the production process for the building up of the integrated list (BIFA), it is necessary to underline problems that have to be faced in terms of: Units, Coverage, Variables.

- Administrative unit versus statistical unit

It is clear that the majority of sources do not use a unit definition that directly identifies the statistical unit that is the agricultural holding. AGEA and AA:ZZ are the two principal sources for which the two concepts are almost the same. For that reason these two sources become the first pivot in the setting up of the list.

- Coverage is heterogeneous among sources.

Some sources have high risk of over-coverage in the sense that units cannot carry out an agricultural activity. It is the case of tax declarations where any landowner has to declare any land's property; sometimes even the presence of an agricultural income could be only the declaration of a cadastral rent. The same happens for the Land Registry, it covers all the lands but there is no indication whether an activity is carried out; moreover as the same parcel can belong to many co-owners, the identification of the holder is still more difficult. On the contrary AGEA - that in theory should have a total coverage - could be underestimated because some crop productions are not subject to aids. A good complete coverage is estimated for bovine animals and for the self-employed workers as their respective sources are arranged to these purposes.

- Variables

There are some basic farm structure characteristics that the Farm Register or the pre-census list supporting the Census have to contain: location variables, information on the holder, the utilized agricultural area according to the different productions, livestock, labour force variables. Administrative sources have a different coverage as regards to these variables. Whereas AGEA gives details on crops productions and the area (utilized and potential) in square meters, AA:ZZ covers the amount of bovines and other animals if declared. The income deriving from an economic activity carried out on the land is calculated according to some cadastral survey then this variable could be used as proxy of the size or of activity status of a unit.

Since Land registry is available, land's income can be associated at the parcel and its use destination can indicate the product crop that of course can be different from the actual one.

The production process of the prototype of the pre-census list can be divided into three macro phases:

- 1 – The pre-treatment of each administrative file
- 2 – The physical integration: the intra-archive link and the link among different archives
- 3 – The units identification process

In particular the linkage process is realized in two steps:

- a) the treatment and intra-archive integration i.e. records of the same input source are linked together
- b) integration among the different input sources using many deterministic codes:
 - b1) the integrated AGEA-based list
 - b2) the integrated not AGEA-based list

1) The pre-treatment macro phase

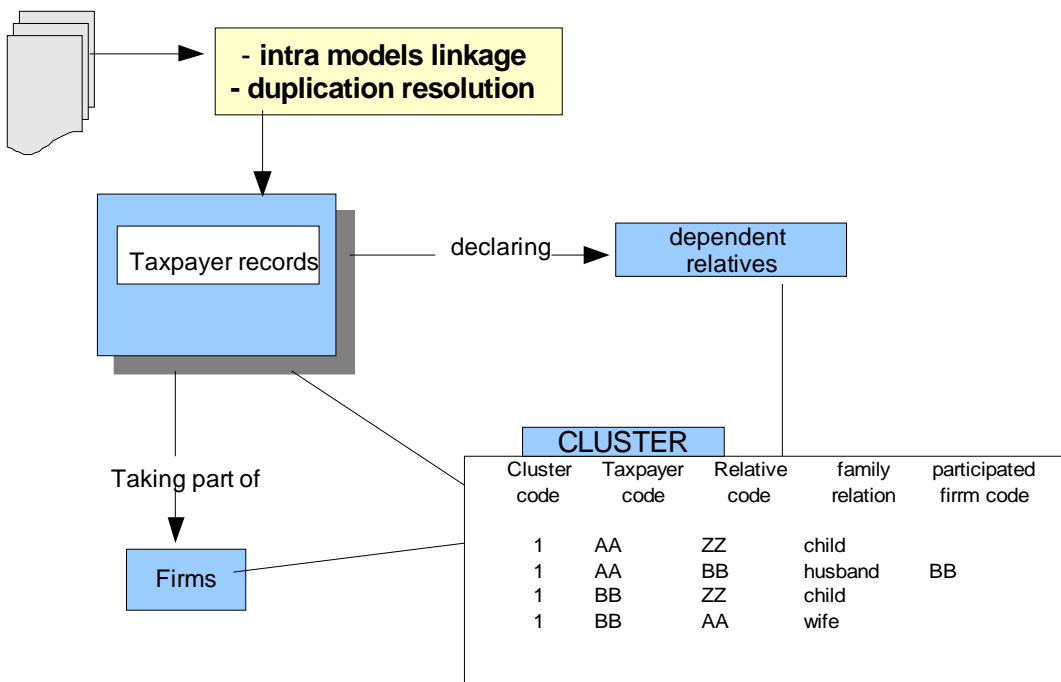
Each source needs a specific pre-treatment process before being compared and integrated. Some standardization and normalization operations involve common variables like location, fiscal code (correctness and presence is evaluated). As location, at least at municipality code level, is one of the most relevant variables, many checks and decoding activities have been done to transform the values of this variable from the input source proper classification into statistical codes. Identification codes are also tested (in terms of internal coherence) in order to be used afterwards in the link process. But as each source has its own specificity, then a different pre-treatment is requested.

The process starts by taking into consideration the three most significant and specific sources that are AGEA, AA.ZZ. and the land's property income (RA).

Each source contains more than one key for the linkage. With regard to AGEA, the primary key for unit identification is the fiscal code (called CUAA). Each CUAA represents an agricultural holding and identifies the holder (a natural or juridical person). Each CUAA can or cannot declare a land: in presence of a land, identification codes of parcels and identification code of landowners - if different from the primary key (the CUAA) - are available information. The landowner's fiscal code represents the secondary key of this source. Primary and secondary keys records are linked each others and prepared for the following phases.

A similar structure is present in the AA.ZZ. source, where the primary key is given by the fiscal code of the animals' holder then the relationship with the fiscal code of the livestock farming owner is built-up. More than one identification key can be used in the RA treatment source: primary key is given by the fiscal code of the taxpayer, then secondary codes are fiscal codes of dependent relatives and of participated firms. A new statistical unit is created (cluster) by using the system of keys for linking primary and secondary keys (Picture 3).

Picture 3 – The integration of RA records and the delineation of clusters



A cluster is an important structure that allows to delineate relationships among different units so that more declarations are aggregated together mainly by family links so as to represent a new unit (proxy of the same holding). The cluster will be used for the following integration of different sources.

2 – The physical integration: the intra-archive link and the link among different archives

After the pre-treatment phase is done, the integration process (step b1) starts by matching the above mentioned sources hierarchically⁴ using all the primary and secondary keys in a schematic way. Each matched record (CUAA or Fiscal code, in single cluster or in multiple cluster) is then classified according to type of link between the pivot AGEA source and the AA.ZZ and RA. Type of links are classified as follows:

- Direct link: a match between the primary key of AGEA and the primary key of the other source.
- Indirect link: a match between the primary key of AGEA and the secondary keys of the other source.
- Complex link: a match between the secondary key of AGEA and the primary/secondary key of the other source.

As other sources do not contain more than a key (only one fiscal code per unit) the integration process continues by matching the Integrated Agea-based list with other sources.

Residuals of all the sources (apart AGEA and AA.ZZ) are then matched to obtain the Integrate not-AGEA based list (step b2). The strategy to distinguish between these two lists is oriented to stratify units and related variables according to a different level of quality.

A different approach is followed to integrate the Land registry that presents two identification keys: 1) the parcel represented by a string of 15 figures that can be matched with the AGEA data when a CUAA declare a land; 2) the landowner's fiscal code, a variable with a very low quality (missing data). Then the integration process involving the Land registry is very complex to manage.

3 – The units identification process

Each integrated unit is classified according to some variables that directly originate from the input source (i.e. the amount in hectares of agricultural utilized area) or are derived from the result of integrated sources (i.e. estimated rating based on the composition of integrated sources).

Identification of potential units in scope – At the end of the integration process a huge amount of integrated data is obtained. Many units present an high degree of reliability (high number of sources integrated,

⁴ AGEA as first, AA.ZZ as second and then RA for only those units having in common a link with AGEA and/or AA.ZZ.

presence of AGEA, signals of existence, etc.) others are more difficult to understand whether they are simple owners of piece of lands without carrying out any significant activity. Two possibilities of identification of potential agricultural units have been tested: 1) to set a threshold so that only units classified under or over it can be considered eligible, i.e. an existing unit, active, carrying out agricultural activity of a certain consistency; or 2) no threshold is applied and only after a check on the field (the planned survey) statistical methods will be introduced to build-up models of discrimination among agricultural or not agricultural units. In addition to the need to assess the eligibility of a unit another important issue is to ascertain the existence of relationships among units, that is the correctness of the built-up cluster structure. In particular two strategies have been followed to reach units involved in the same cluster: a) all units have to be checked and then links should be assessed or b) only representatives of a cluster can be interviewed and asked about the existence of supposed links.

Imputation of basic characteristics – In addition to identification codes, the purpose of the integration process was to realize a list of units and a few associated variables useful for the survey planning. Apart from the name each unit is identified by location variables like the address of residence and the location of lands and/or livestock. Moreover, not all the units present a land (it is the case of co-operatives for example). Location variables are very important also because the quality survey is limited only to some municipalities, then they became the basic stratification variables for sampling. Some other variables allow to classify each unit according to some signals of: a) existence that take into consideration all dates (of validation, cessation, updating) available from sources; b) economic activity i.e. some units although they carry out a principal economic activity in other sectors than agriculture they own a land (for which reason? Is it for activity purpose or just for small kitchen gardens?) ; c) size, for some units it is possible to have the number of animals, hectares of agricultural utilized for farming according to different crops, agricultural income.

The list of units, their internal links, their main characteristics represent the contents of the prototype-list to support the quality pre-census survey.

The survey for checking coverage and quality of the prototype of list units and the sampling strategy

As the building up of the prototype-list is the first planned activity before the farm register is implemented, it is of fundamental importance to test its quality. An expensive quality survey has been set up with the aim to: i) check the integration methodologies, ii) test the relevance of the used administrative sources, iii) test the criteria of units identification and iv) compare methods for characteristic imputation. This survey has been launched beginning October this year and results are expected by March 2009. These results will help to improve methodologies and to fit statistical methods in order to produce the final pre-census list. This list will be the support for the 2010 Census of Agriculture; only at the end of the census activities the Farm Register will be set-up, having as first benchmark exactly the Census results. The tested and validated integration process will be used then for updating purposes.

The Census directorate in accordance with the network of regional statistical offices present on the territory has selected 80 municipalities representing different agricultural areas according to the results of the last Census of Agriculture.

The sample survey procedure follows a multi-domain methodology strategy where the higher is the quality of a unit - i.e. the unit presents many signals of agricultural status, it belongs to the AGEA-based archive, it presents a high level of utilized agricultural area etc.- the lower its probability of being sampled. As only 80 municipalities have been chosen and due to the constraints in terms of number of units to be interviewed, a big attention is then given to those "uncertain" units that represent about 50% of the entire universe. They probably will request high efforts in terms of discovering their actual status and for that reason it is stressed the need to have a high quality survey rather than to bet on coverage.

The survey technique consists in face-to-face interviews carried out in the unit's residence place asking information about all lands and livestock wherever they are located. Detailed information is requested at municipality level such as the agricultural utilized area by each crops growing, number of different species of animals, some information on the farm structure and in particular on the relationship with other apparently independent units. In particular, in presence of clusters formed by individuals (family structures) an head-cluster has been identified and he/she is interviewed even about the existence of links; for units in cluster involving individuals and firms like partnerships, interviews are carried out separately and the reconciliation is left to the ex post desk activities.

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