

## WORKSHOP

### *Modernizing Agriculture Statistics*

# Farms' classification: a simple methodology based on the last agriculture census data

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ISTAT - Agriculture, forestry and fishery statistics

Budapest, October 2-3, 2023

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# 1. The 2020 census of agriculture

## The census of agriculture

- ✓ As well known, the last census of agriculture was mandatory in each European Union country, and had the main purpose of updating the structural data collected with the 2010 census and the further IFS sampling surveys referred to 2013 and 2016. In Italy it was referred to the date of **1 October 2020**
- ✓ In Italy the final number of active farms was **1.133.023**
- ✓ Within December 2023 ISTAT is going to finalize the data dissemination process, started in June 2022
- ✓ Available data do not include revenues but include the standard output (SO)
- ✓ In Italy beyond the huge set of census indicators requested by the Regulation (EU), 2018/1091, additional questions were added, concerning: generational turnover, innovation, digitization, breakdown of farm revenues by source, market orientation of the farm, the COVID emergency

# 1. The 2020 census of agriculture

## The census of agriculture

- ✓ According to the census data, the most common criteria for classifying farms are based on:
  - Technical economical orientation
  - Agricultural surfaces classes
  - Standard output classes
  - Regions and other more detailed territorial domains
  - Specific binary (Yes/No) features (for instance: organic farming, young manager)
- ✓ Crossed classifications are used as well, with the goal of analyzing the main changes occurred with respect to previous years (2010 in particular)
- ✓ Statistical clustering is often used in order to split farms into homogeneous groups, which include units with similar features. However, the mathematical algorithms imply semantic problems and often they mix structural and behavioral data (for instance: farm's location is not an efficiency indicator)

## 2. Efficiency: overview of farms' classification criteria

- ✓ Efficiency-based classification of agricultural holdings is carried out on the basis of statistical indicators which can be related to the farms' capability to modernize its management and to promote sustainable agriculture, possibly available on a yearly basis
- ✓ In this context, the main goal of our analysis is the identification of farms “**at risk**” of disappearance: farms which have few sources of income, carry out traditional agriculture, are managed through a few working days and can be mainly considered “small” farms
- ✓ In order to identify farms at risk, size indicators (surfaces, livestock, standard output) are not the only ones to be taken into account
- ✓ Census data do not include economic indicators as valued added or net incomes; however, specific census indicators can be used

## 2. Some farms' classification criteria

### 1. The FADN survey reference population

- ✓ The Farm Accountancy Data Network (**FADN**) - RICA in Italy - is an annual sample survey established by the European Economic Commission in 1965
- ✓ The FADN survey does not represent the entire universe of farms active in a given territory, but only those which, due to their economic size, can be considered professional and market-oriented
- ✓ The FADN field of observation, therefore, is a subset of that surveyed by ISTAT through the census
- ✓ In Italy, the minimum threshold for inclusion in the FADN observation field is **8.000 euros** of annual standard output value
- ✓ The farms concerned with FADN represent in the EU 90% of the agricultural area and of Standard Output

## 2. Some farms' classification criteria

### 2. FAO Small-Scale Food producers (SSF) – SDG 2.3.2

- ✓ SSFs operate an amount of land falling in the first two quintiles (the bottom 40 percent) of the cumulative distribution of **land size** at national level (measured in hectares); and ..
- ✓ ..operate a number of livestock falling in the first two quintiles (the bottom 40 percent) of the cumulative distribution of the **number of livestock per production unit** at national level (measured in Tropical Livestock Units – TLUs); and..
- ✓ ..obtain an annual economic revenue from agricultural activities falling in the first two quintiles (the bottom 40 percent) of the cumulative distribution of **economic revenues from agricultural activities per production unit** at national level. So...
- ✓ ...**Small-scale food producers are defined as those falling in the intersection of the bottom 40 percent of the cumulative distribution of land, livestock and revenues**
- ✓ Within the resulting set identified by these criteria, **producers earning a revenue higher than 34.387 Purchasing Power Parity (PPP) Dollars per year will be excluded**

## 2. Some farms' classification criteria

### 3. Family farmers

- ✓ According to FAO definition, "family farm" is any farm under family management (having, by definition, certain legal status), where  **$\geq 50\%$  of the regular labor force is provided by family workers**
- ✓ On the basis of the Italian agriculture census data:
  - All the active units (agricultural holdings) have been considered, including those in the *Frame extension* (see Reg. EU 2018/1091)
  - The labour input was based on AWU (Annual Working Units) - not on number of *persons* - since workers may contribute only a few hours to the work
  - The legal statuses compatible with the definition of "family farm" were: Sole holder who is the single manager; Holder is co-manager with spouse or a family member; Sole holder holding and the holder's spouse is the manager of the holding; Sole holder and the manager is a member of the holder's family, not spouse



### 3. The classification methodology SMOD

#### Basic rationale

- ✓ The methodology should be simple and should allow to understand why a farm is classified in a certain way
- ✓ Clusters of farms should not be the result of mathematical algorithms
- ✓ It should be based on whether or not the farm meets certain requirements on the basis of specific management strategies
- ✓ These requirements should concern specific farm behaviors and not to structural characteristics (geographical location, altitude, kind of municipality, etc.)
- ✓ The methodology should be replicable frequently (ideally every year), so it is important to have all the data necessary for the calculations.

### 3. The classification methodology SMOD

#### 1. Size

- ✓ Standard output is the most important farm size indicator
- ✓ It synthesizes land and livestock size (but not other gainful activities and subsidies from the EU)
- ✓ It can be calculated every year on the basis of the farm register

#### 2. Market orientation

- ✓ The Italian census questionnaire included a question (not requested by the IFS Regulation) on the final destination of production:
  - a. only self-consumption
  - b. self-consumption  $\geq 50\%$
  - c. self-consumption  $> 0$  and  $< 50\%$
  - c. self-consumption = 0

## 3. The classification methodology SMOD

### 3. Organic farming

- ✓ It is the most important indicator related to the farm capability to pay the right attention to environment safety and food security, even though it is not the only indicator related to environment
- ✓ The EU aims to reach at least 25% of agricultural surfaces managed through organic farming within 2030

### 4. Differentiation of incomes (Other Gainful Activities - OGA)

- ✓ Empirical evidence shows better economic performances and larger survival probability for those farms which carry out other gainful activities beyond the primary agriculture activity
- ✓ In Italy, agro-tourisms is the most frequent OGA

### 3. The classification methodology SMOD

#### The methodology

- ✓ Based on census data, it is possible to identify farms:
  - a) with  $SO \geq 8.000$  euro (Yes or No)
  - b) with self-consumption  $< 50\%$  (Yes or No)
  - c) with organic farming (Yes or No)
  - d) with OGAs (Yes or No)where “NO” is a possible signal of risk
- ✓ Moreover, as regards the same farm it is possible to cross each binary feature (Yes/No) with the other ones
- ✓ Overall, we can have 16 different (Yes/No) combinations ( $2^4$ )
- ✓ The 8.000 euro threshold is the same used in the Italian FADN survey and is also used by EUROSTAT for the census data dissemination

### 3. The classification methodology SMOD

- ✓ Therefore, we can classify farms as such:

Number of "Yes"	Classification
4	Optimal
3	Almost optimal
2	Medium
1	Almost critical
0	Critical

- ✓ If  $n(i)$  is the number of farms having  $i$  "Yes" we can define:
- **OI = Optimality Index** =  $[n(3)+n(4)]/n$
  - **CI = Criticality Index** =  $[n(1)+n(0)]/n$
  - **RR = Risk Ratio** =  $CI/OI$  = number of farms at risk for each non-risk farm

### 3. The classification methodology SMOD

- ✓ Based on SMOD methodology, other statistical indicators, concerning the structural features of the farm and characteristics of the farm manager, may be used as “filters” in order to identify further sub-populations
- ✓ The link between census data and the FADN data may be used for post-stratifying economic indicators (typically valued added and net incomes) using the SMOD classification
- ✓ However, in Italy FADN does not include farms with SO < 8.000 euro (so all the farms included score at least 1 in SMOD criteria)
- ✓ Even though SO and organic farming data can be updated every year, among other gainful activities only agro-tourisms can be updated on a yearly basis using administrative sources. At the moment, market orientation (a stable feature) can only be updated every three years.

## 4. Main results – Preliminary data


### Number of farms with certain features – 2010 vs 2020

	Number of farms		% share on total		% changes
	2010	2020	2010	2020	2020/2010
<b>Total</b>	<b>1.620.884</b>	<b>1.133.023</b>	<b>100,0</b>	<b>100,0</b>	<b>-30,1</b>
Standard output $\geq$ 8.000	602.388	522.019	37,2	46,1	-13,3
Market oriented	975.490	701.708	60,2	61,9	-28,1
Organic farming	45.167	70.339	2,8	6,2	55,7
Differentiation	76.148	65.126	4,7	5,7	-14,5


- ✓ Between 2010 and 2020 the number of farms decreased by 30,1%
- ✓ In each of the subpopulations considered according to the 4 dimensions the decline was lower, or growth occurred (organic farming: +55,7%)
- ✓ All the relative incidences of the subpopulations on the total have grown

## 4. Main results – All active farms

SO ≥ 8.000 euro	Market oriented	Organic farming	With OGAs	Number of "Yes"	Number of farms	Number of farms %
Yes	Yes	Yes	Yes	4	6.996	0,6
Yes	Yes	Yes		3	35.722	3,2
Yes	Yes		Yes	3	35.273	3,1
Yes		Yes	Yes	3	2.893	0,3
Yes	Yes			2	341.167	30,1
Yes		Yes		2	11.270	1,0
Yes			Yes	2	9.590	0,8
Yes				1	79.108	7,0
No	Yes	Yes	Yes	3	396	0,0
No	Yes	Yes		2	6.082	0,5
No	Yes		Yes	2	5.974	0,5
No		Yes	Yes	2	303	0,0
No	Yes			1	270.098	23,8
No		Yes		1	6.677	0,6
No			Yes	1	3.701	0,3
No				0	317.773	28,0
<b>Total</b>					<b>1.133.023</b>	<b>100,0</b>



Number of "Yes"	Number of farms	Number of farms %
4	6.996	0,6
3	74.284	6,6
2	374.386	33,0
1	359.584	31,7
0	317.773	28,0
<b>Total</b>	<b>1.133.023</b>	<b>100,0</b>



Optimality index	7,2
Criticality index	59,8
Risk ratio	8,3



## 4. Main results – All active farms

### Standard output, utilized agriculture area, full-time equivalents

Number of "Yes"	Average x farm			SO x UAA	SO x FTE	% share on totals		
	SO (euro)	UAA (ha)	FTE (years)			SO	UAA	FTE
4	160.206	38,0	2,75	4.215	58.233	2,0	2,1	2,5
3	168.977	31,7	1,93	5.336	87.534	22,2	18,8	18,9
2	101.635	19,9	1,14	5.106	89.071	67,3	59,5	56,3
1	11.019	5,3	0,31	2.083	35.225	7,0	15,2	14,8
0	2.694	1,7	0,18	1.556	15.251	1,5	4,4	7,4
<b>Total</b>	<b>49.904</b>	<b>11,1</b>	<b>0,67</b>	<b>4.515</b>	<b>74.548</b>	<b>100,0</b>	<b>100,0</b>	<b>100,0</b>

- ✓ 317.773 farms (28%) belonging to the **critical domain** produce 1,5% of SO and manage 4,4% of UAA only
- ✓ **Critical domain farms** need slightly more than 2 working months in a year

## 4. Main results

### Focus on certain sub-populations of farms

Number of "Yes"	All farms	Disadvantaged zones	Young farm manager	Male farm manager	Diploma or degree	Farm with livestock
4	0,6	0,4	1,5	0,7	1,2	1,2
3	6,6	4,7	15,1	7,2	10,2	12,0
2	33,0	25,5	48,7	35,8	36,3	47,4
1	31,7	33,4	22,7	30,2	28,3	22,6
0	28,0	36,0	11,9	26,1	24,0	16,7
<b>Total</b>	<b>100,0</b>	<b>100,0</b>	<b>100,0</b>	<b>100,0</b>	<b>100,0</b>	<b>100,0</b>
Optimality index	7,2	5,1	16,6	7,9	11,4	13,3
Criticality index	59,8	69,4	34,7	56,3	52,3	39,3
<b>Risk ratio</b>	<b>8,3</b>	<b>13,7</b>	<b>2,1</b>	<b>7,1</b>	<b>4,6</b>	<b>3,0</b>

## 4. Main results

### Comparison between 2020 and 2010

Number of "Yes"	2020		2010	
	Number	Number %	Number	Number %
4	6.996	0,6	6.580	0,4
3	74.284	6,6	76.783	4,7
2	374.386	33,0	470.119	29,0
1	359.584	31,7	507.201	31,3
0	317.773	28,0	560.201	34,6
<b>Total</b>	<b>1.133.023</b>	<b>100,0</b>	<b>1.620.884</b>	<b>100,0</b>
Optimality index		7,2		5,1
Criticality index		59,8		65,9
<b>Risk ratio</b>		<b>8,3</b>		<b>12,8</b>

✓ Between 2010 and 2020 the Risk ratio decreased (from 12,8 to 8,3)

✓ the decrease was mostly due to the disappearance of many small farms

## 4. Main results – All active farms

### Comparisons among classification criteria (year 2020)

Reference population	SO<8.000 euro	Small Scale Farmers (SSF)	Family farmers (FF)	SMOD: almost critical and critical
<b>Total</b>	<b>53,9</b>	<b>78,5</b>	<b>92,0</b>	<b>59,8</b>
Male	50,5	75,2	91,7	56,3
Female	61,4	85,6	92,8	67,4
Young farm manager (≤39 years)	27,8	59,8	86,8	34,7
Older farm manager (>39)	56,4	80,6	92,7	62,1

- ✓ SMOD identifies a more realistic number of farms at risk than SSF or FF
- ✓ 59,8 farms on 100 are at risk, more than 53,9 identified by SO: even farms with SO > 8.000 may be at risk

## 5. Some conclusions

- ✓ Modernization of agricultural holdings is a fundamental issue, as also stated by the CAP. Its evaluation is difficult because of its multidimensionality, as well as because of the lack of statistical data able to cover the whole farms' profile on a yearly basis
- ✓ More in depths analyses should be carried out in order to assess which farms are “at risk”. In this context we proposed an approach focused on some main “behaviors” of farms, rather than on farms' structural data or the characteristics of the farm manager
- ✓ The FAO SSFs approach remains the main reference point, but it takes into account only the “dimensional” profile of farms and its use in the EU context may, as Italy's case shows, over-estimate the number of farms at risk

**Thank you for your patience and your attention!**