



Diversity, resilience and rural development

Giovanni Quaranta – Rosanna Salvia
University of Basilicata, Italy
Medes Foundation, Italy

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Outline

- Objective
- Diversity (what is it and how to measure it?)
- Diversity and resilience
- Resilience and sustainable rural development
- Measures of socio-economic diversity
- Some empirical evidences

Objective

- To analyze the role of economic and social diversity in defining alternative patterns of development in rural social-ecological systems, considered as strongly coupled, integrated systems where natural and social components behave in non-linear ways and exhibit marked thresholds in their dynamics.
- Addressing:
 - The existence and relevance of direct positive links between diversity and sustainable rural development
 - Alternative patterns of development according to the starting diversity

Diversity, Resilience, Development

- Diversity & Resilience
 - Resilience & Sustainable Rural Development
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Diversity

- Within socio-ecological systems literature diversity can be seen according to two categories:
 - 1) functional diversity, which is the number of different functional groups or species present in a system and
 - 2) response diversity, which is the range of responses to disturbances (Walker et al.2006).

Diversity in rural SES

- When using this concept in rural socio-ecological systems, there are three different ways to approach it:
 - 1) diversity is used to refer to non-agricultural activities of farmers,
 - 2) diversity is used to refer to the variety of economic activities within a region, whereby agriculture is seen as one of the possible economic activities and
 - 3) the diversity of agricultural activities within a region.

Diversity and resilience

- It is generally agreed that diversity, as a key of resilience, is central to socio-ecological systems and that diversity is a key requirement for their long-term (sustainable) functioning, (Ostrom 2005).
- The resilience in socio-ecological systems can be defined as “the capacity of a system to absorb shock and disturbances, while still maintaining the same functions, structure and feedbacks (Walker and Pearson 2007).

Resilience and Sustainable Rural Development

- Resilience is often confused with sustainability or is considered inherently good.
- While resilience is the ability of the system to keep the same functions and structures, a system is still sustainable when moving from a sustainable state to another sustainable one (i.g. traditional rural system based on agricultural production vs sustainable rural tourism).
- While sustainability is intrinsically good, the high resilience of pathological lock-in states are examples of high resilience where degradation within the agroecosystem creates a persistent system, which is difficult to disturb and move to a better state.

Diversity, resilience, development

- There is no full consensus on the extent to which diversity promotes a SES's resilience and therefore its adaptive capacity, that is its ability to cope with changes and subsequently re-generate and re-organize itself.
- Diversity often comes at a price, both ecologically, socially and economically.
 - Whilst economic diversity is widely accepted to increase the resilience of a region's economy by making them less sensitive to fluctuations caused by factors outside the region, (Nourse 1968 and Richardson 1969), it is also true that economic growth depends on economic specialization. If, on the one hand, economic stability is achieved through diversity and, on the other hand, economic growth is based on economic specialization, theoretically one must be sacrificed for the other.
 - Diversity can complicate governance
 - Also in ecological perspective, diversity has been questioned in its direct link with increasing resilience, considering both functions and interactions among species

Diversity Matrix

Components	Perspectives		
	<i>Diversity of agric. activities</i>	<i>Diversity of non-agric. activities</i>	<i>Diversity of economic activities</i>
<i>Natural</i>	Cropping mix	Farm natural resources availability	Territorial natural resources availability
<i>Economic</i>	Physical size of farms	Farm diversification	Specialization index Tourism flow
<i>Social</i>	Educational level Wage workers	Family members off-farm job	Employment and educational profile
<i>Institutional</i>	Land tenure	Farm participation in cooperatives, associations, etc.	Land protection

Operationalizing indicators

- **Cropping mix:** x = proportion of arable land; permanent crops; pasture on total agricultural land
- **Physical size of the farms:** x = proportion of number of farms belonging to different UAA classes on total UAA
- **Educational level:** x =proportion of population with laurea and diploma on total population with degree
- **Wage workers:** x =proportion of wage workers on total agricultural labour
- **Land tenure:** x = proportion of the hired and property land on total farm land
- **Farm Natural resources availability (i.g. irrigation water):** x : proportion of irrigated and non irrigated farms on total farms
- **Farm diversification :** x = proportion of farm with alternative activities (agriturism, energy etc) and farms without on total farms
- **Family members off-farm job:** x = proportion of farms with family members having off-farm job and farms without on the total number of farms
- **Farm participation in coop, association etc:** x = proportion of farm associated and farms not on the total number of farms
- **Territorial natural resources availability:** x = proportion of forest surface and not on the total municipality surface
- **Specialization index:** x = proportion of AV of each sector on the total AV
- **Tourism flow :** x = proportion of beds per each turistic typology (hotel, agriturismo etc) on total beds
- **Employment profile:** x = proportion of different typologies on total employed
- **Land protection:** x = proportion of protected and not protected land on total municipality surface

Rural Diversity Index - RDI

To assess diversity in rural areas the *RDI* (Rural Diversity index) has been developed.

The *RDI* uses the following formula:

$$RDI = \sum_{j=1}^v \frac{P_j}{v} \quad RDI, P_j = [0, 1]$$

where

v = variables considered to describe diversity

$$P_j = \left[\prod_{i=1}^n (f_i)^{1/n} \right] * n$$

n = number of classes

$$f_i = \frac{a_i}{A}$$

a_i = value of variable for each class considered

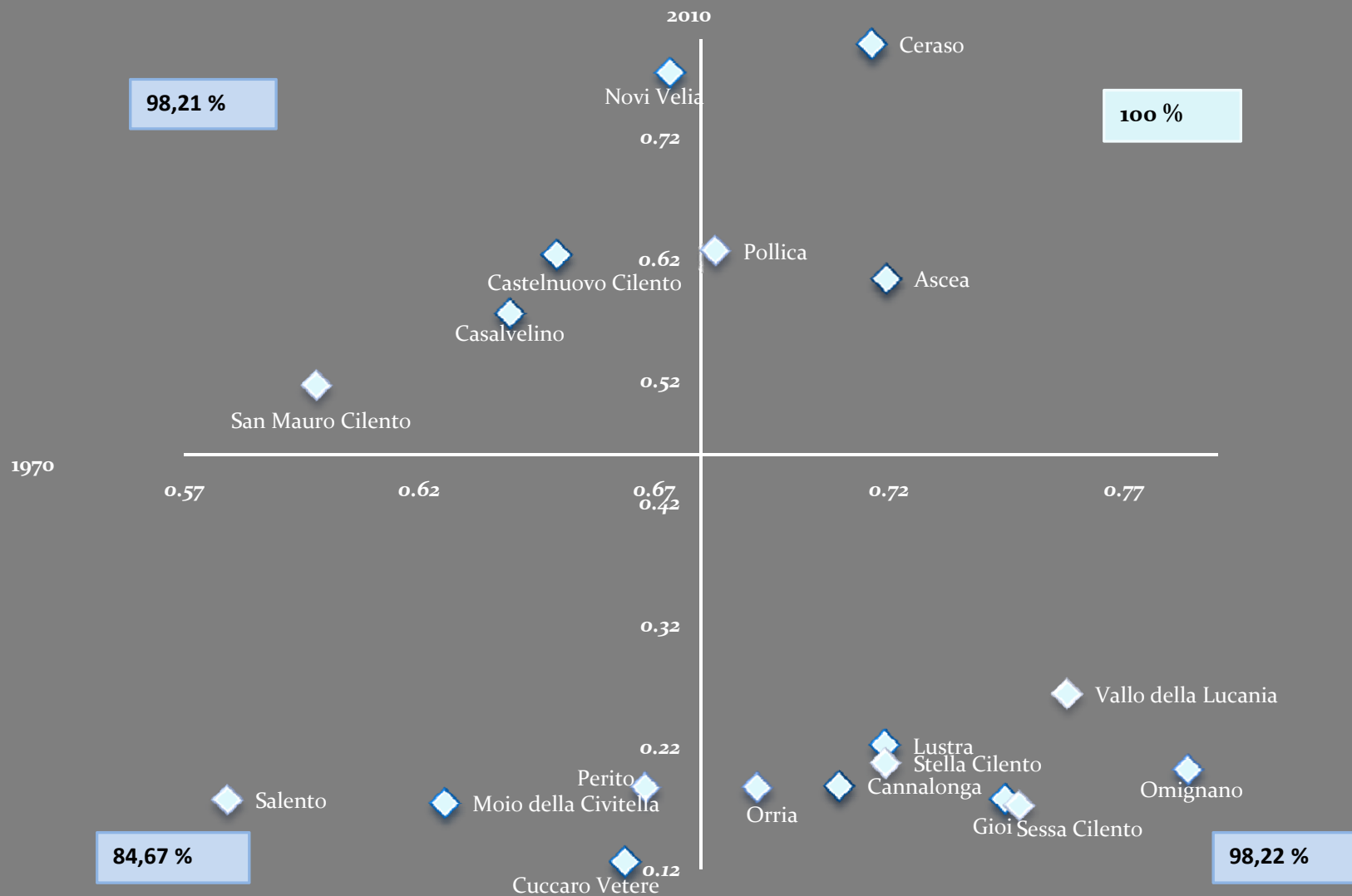
$$A = \sum_{i=1}^n a_i$$

The *RDI* assumes a value of between 0 and 1, where 1 corresponds to maximum diversity and values below 1 correspond to a lesser degree of diversity.

Results obtained (an example)

<i>Municipalities</i>	<i>cropping mix</i>				<i>physical size of the farm</i>				
	<i>1970</i>	<i>1982</i>	<i>1990</i>	<i>2000</i>	<i>1970</i>	<i>1982</i>	<i>1990</i>	<i>2000</i>	<i>1971</i>
Ascea	0,87	0,99	0,87	0,54	0,43	0,42	0,31	0,26	0,48
Cannalonga	0,72	0,73	0,76	0,31	0,44	0,42	0,00	0,00	0,42
Casalvelino	0,95	0,85	0,66	0,61	0,34	0,36	0,34	0,21	0,45
Castelnuovo Cilento	0,99	1,00	0,91	0,86	0,41	0,54	0,45	0,39	0,42
Ceraso	0,91	0,96	0,87	0,47	0,51	0,51	0,46	0,26	0,55
Cuccaro Vetere	0,64	0,74	0,75	0,21	0,49	0,47	0,00	0,00	0,42
Gioi	0,87	0,88	0,73	0,44	0,59	0,54	0,51	0,37	0,53
Lustra	0,82	0,92	0,98	0,56	0,61	0,55	0,00	0,40	0,49
Moio della Civitella	0,77	0,88	0,79	0,33	0,23	0,25	0,00	0,00	0,55
Novi Velia	0,57	0,58	0,44	0,19	0,20	0,00	0,00	0,00	0,48
Omignano	1,00	0,35	0,68	0,36	0,50	0,55	0,57	0,00	0,43
Orria	0,79	0,76	0,61	0,38	0,53	0,53	0,41	0,31	0,41
Perito	0,82	0,79	0,60	0,53	0,61	0,60	0,49	0,43	0,42
Pollica	0,94	0,84	0,45	0,27	0,51	0,60	0,60	0,39	0,63
Salento	0,66	0,80	0,68	0,21	0,62	0,59	0,62	0,35	0,47
San Mauro Cilento	0,13	0,93	0,70	0,39	0,49	0,43	0,00	0,00	0,51
Sessa Cilento	0,86	0,50	0,89	0,47	0,55	0,59	0,53	0,33	0,50
Stella Cilento	0,81	0,56	0,50	0,21	0,56	0,57	0,00	0,27	0,38
Vallo della Lucania	0,83	0,94	0,90	0,58	0,33	0,34	0,30	0,19	0,67

Trend RDI 1970-2010 vs Per Capita AV



Some conclusion

- There is a positive link between diversity and development
- Four patterns could be recognized
- The RDI proved to be:
 - Flexible
 - Ease to apply
 - Ease to interpret [0,1]
 - Able to incorporate all kind of variables
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