



COMPARISON OF SELF-ASSESSMENT AND OBJECTIVE INDICATORS OF ATTRIBUTES DRIVING FARMS RESILIENCE

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CENTRO DE INVESTIGACIÓN Y TECNOLOGÍA AGROALIMENTARIA DE ARAGÓN

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Background



- Strengthening farming systems' resilience is on the top of the EU and national political agendas, and research.
- Several approaches have been proposed to develop this concept (at the farm level)...

...there is still a lack of methodological consensus.

- Multiple definitions of reliance lead to different analytical frameworks
- Resilience is a latent property, which most times cannot be measured directly
- So, what do we measure?



Background



- Measuring resilience is key for practical reasons.
- Quantitative assessments based on objective or subjective measures; each have specific strengths and weaknesses.
- **Objective** measurement: Fixed, proxy indicators routinely collected...

...but difficult to agree on a common set (usually huge), which use might not be applicable across systems

• **Subjective** measurement: account for farmers capacity and contextual information, better for 'soft' processes such as social capital or community cohesion....

...but what some uncertainty about what is being measured

• Little is known about how subjective self-assessment and objective measures compare.





Objectives

Provide a comparison of self-assessed and objective farm resilience measurement approaches

Strengthening the resilience of small ruminant local breed farming systems: from covid-19 to global change (RUMIRES). Project PID2020-120312RA-I00 funded by:





Methods. Resilience framework; definition



"Ability to ensure the provision of the **system functions** in the face of increasingly complex and accumulating **economic, social, environmental and institutional shocks and stresses,** through capacities of **robustness, adaptability and transformability**"

RESILIENCE IS A LATENT PROPERTY

Meuwissen et al., 2019

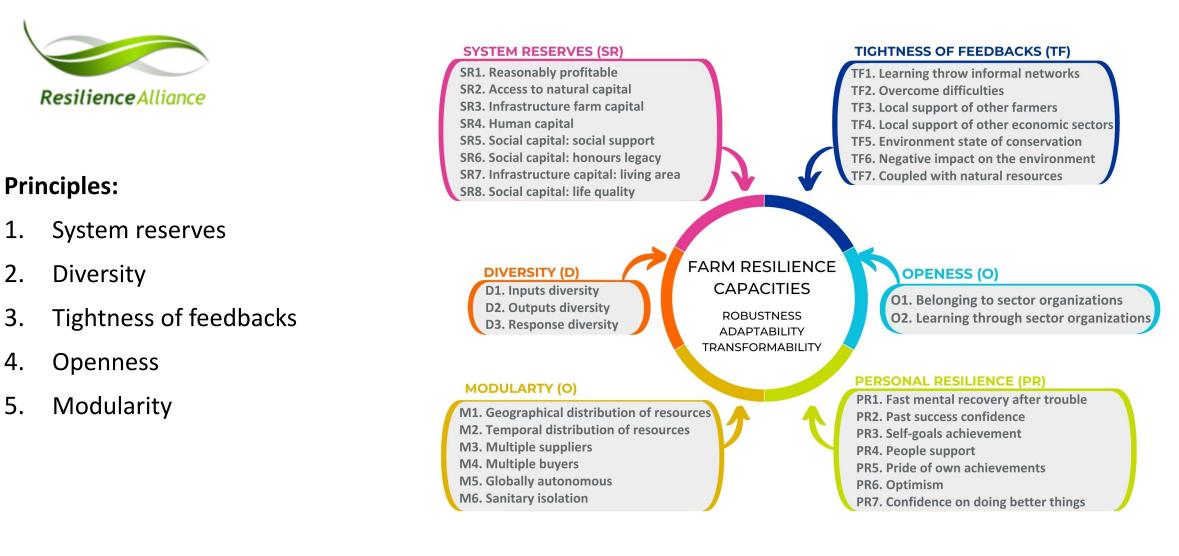
Which results from farm characteristics:

- **Resilience principles**: generic system characteristics
- **Resilience attributes**: specific system characteristics



Methods. Resilience framework; principles and attributes











Methods. Resilience indicators development



Identified farm attributes were evaluated by:

1. Farmer self-assessments; likert type scales.

| Infrastructure capital: | My family and I have access to the services we need in our |
|---------------------------------|---|
| living area | daily lives in areas close to our home |
| Social capital: life quality | My work as a farmer gives me a good quality of life |
| Natural capital | My farm has access to the natural resources it needs to guarantee its viability |

- 2. Technical farm features (Objective indicators).
- Distance to supermarkets, schools, hospitals
- Days off per week, and years, working hours
- Common lands, pastures area, crop área, ha per females...





Material. Farm sample



Small ruminant farms

- 1. Meat sheep in Aragon
- 2. Dairy sheep in the Basque country
 - 3. Dairy sheep in Extremadura
- 4. Meat and dairy gotas in Andalusia



| Pogion | N⁰ |
|----------------|---------|
| Region | surveys |
| Aragon | 57 |
| Basque country | 41 |
| Extremadura | 9 |
| Andalusia | 53 |
| TOTAL | 160 |



Statistical analysis



Farmer self-assessments



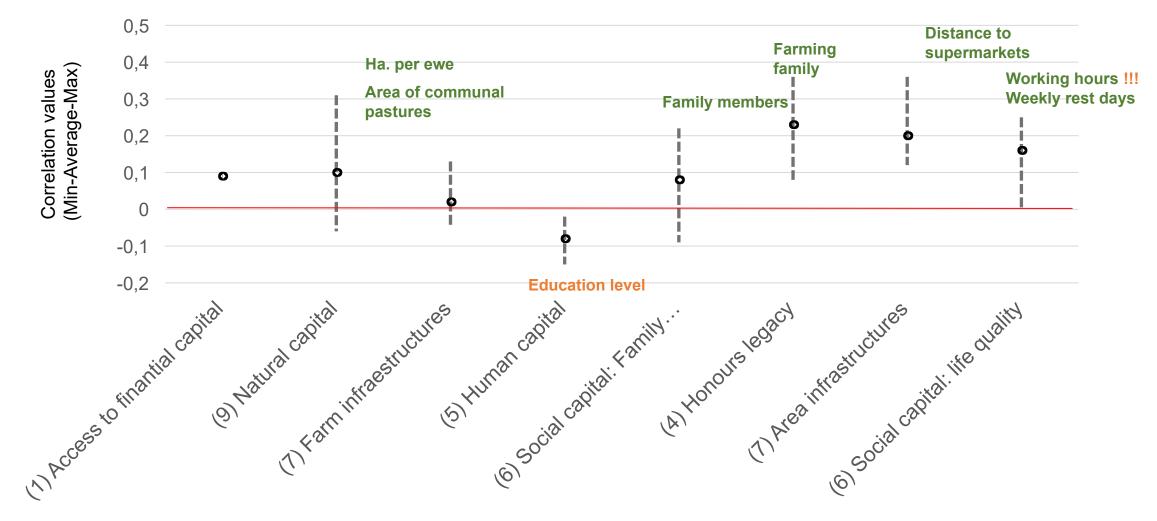
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| Image: Image: Image: Image: <td></td> <td></td> <td></td> <td>0,14</td> <td>0,09 0,</td> <td>11 -0,10</td> <td>-qai</td> <td>91</td> <td>0,11</td> <td>0,08</td> <td>0,11</td> <td>0,09</td> <td>0,08 0,1</td> <td>0,02</td> <td>-q01</td> <td>-0,05</td> <td>0,02</td> <td>0,15</td> <td>qos</td> <td>0,10 0</td> <td>106 0</td> <td>-402</td> <td>0,12</td> <td>0,02</td> <td>-0,03</td> <td>0,05</td> <td>-0.04</td> | | | | 0,14 | 0,09 0, | 11 -0,10 | -qai | 91 | 0,11 | 0,08 | 0,11 | 0,09 | 0,08 0,1 | 0,02 | -q01 | -0,05 | 0,02 | 0,15 | qos | 0,10 0 | 106 0 | -402 | 0,12 | 0,02 | -0,03 | 0,05 | -0.04 |
| Norm Norm Norm Norm N | - ĉ | ands_planderds | | | -0.04 0. | | -0.07 | -411 | | 0,15 | -0,10 | | | 0.05 | 408 | 0,00 | -0,23 | | -402 | -0.072 -0 | | | | | -0,07 | | -915 |
| 0 | - 6 | u mero, co maradones | | | | | | | | | | | | | | 0.09 | 0.32 | | | | | | | | | | -0.01 |
| 0 | - 6 | u mero, proveedares | | | | | | | | | | 0.02 - | 0.07 0.0 | 0.13 | | 0.16 | 0.03 | | | | | 13 011 | | | -0.02 | -0.28 | -0.23 |
| 0 | M | eméras por una | | | | | 0.02 | 0.02 | | 0.11 | | 0.02 + | 0.25 0.0 | -0.05 | 0.05 | -0.14 | | | | | | 06 -0.12 | 0.05 | -0.06 | -0.17 | | 0.09 |
| 0 | 0 | u re parideras año 📑 | | 0.05 | 0.13 -0. | 08 0,09 | 017 | -0.04 | 0,02 | 0,14 | -0.04 | -0.04 - | 0.08 0.0 | 0.09 | 0.08 | | -0.20 | -0, 22 | | 0.06 0 | 12 0 | 17 0.03 | 0.01 | 0,08 | -0.09 | 0,02 | -0.16 |
| A A A A B | 11 K | neses alim comprado | | -0.13 | 0,01 -0, | 16 0,02 | 0.20 | -010 | 0,00 | 0.27 | 0,03 | -0.17 | 0,10 -0,1 | 0,27 | 0.02 | | -0.03 | $0, D^{2}$ | 0.02 | -0.01 0 | 101 0, | 03 0.21 | -0.11 | -0,05 | 0,06 | -0,07 | -0.41 |
| a A D L D A D | i k | forraie comera | | -0,24 | -0,12 -0,1 | 28 -0,07 | | -0.06 | | 0.17 | -0.11 | -0.17 | 0,05 -0,2 | 0,23 | -010 | 0,23 | 0.11 | 0,05 | 0.21 | -0,03 -0 | | 0.0 200 | -0.19 | -0, 17 | 0,05 | | -0.43 |
| i | | | | -0,01 | -0,06 -0, | 00 0,09 | q 10 | -q.02 | -0, 12 | 0,02 | 0,14 | -0,03 | 0,26 -0,0 | 0,20 | | | 0,26 | 0,03 | 9.20 | | | 01 Q 16 | -0,09 | -0,05 | 0,15 | -0, 10 | -0.15 |
| P Cond Cond Cond Cond | R | _all m_pro pla | | 0,15 | | | -0.05 | | 0,08 | 4,14 | | 0,15 - | | -0,12 | | -0,19 | -0,29 | -0,05 | -425 | | | -418 | | -0,02 | | | 0.20 |
| P Cond Cond Cond Cond | 1.6 | ingerson excl | | 0.07 | 0.00 | -0.09 | | 0.02 | | 0.22 | | 0.11 | 0.00 | -0.26 | | -0.23 | -0.14 | 0,34 | -0.22 | | | 05 -0.22 | -0.09 | 0.08 | -0.12 | 0.10 | 0.39 |
| prime bit dia dia </td <td></td> <td></td> <td></td> <td></td> <td>-010 0</td> <td>-0.08</td> <td>-0.03</td> <td>0.08</td> <td>-0.08</td> <td>0.18</td> <td>0.08</td> <td>0.07</td> <td>0.17 -0.0</td> <td>-0.05</td> <td></td> <td>0.03</td> <td>0.22</td> <td>0.13</td> <td>0.05</td> <td>0.08</td> <td></td> <td>20 0.03</td> <td>0.02</td> <td>0.08</td> <td>0.07</td> <td>-0.08</td> <td>012</td> | | | | | -010 0 | -0.08 | -0.03 | 0.08 | -0.08 | 0.18 | 0.08 | 0.07 | 0.17 -0.0 | -0.05 | | 0.03 | 0.22 | 0.13 | 0.05 | 0.08 | | 20 0.03 | 0.02 | 0.08 | 0.07 | -0.08 | 012 |
| prime bit dia dia </td <td>Y [</td> <td>radices aislam esp. graderi</td> <td></td> <td></td> <td></td> <td>22 -0.08</td> <td>-0.15</td> <td>0.00</td> <td>0.08</td> <td>0.29</td> <td>-0.03</td> <td></td> <td>0.08 0.1</td> <td>-0.06</td> <td></td> <td>-0.14</td> <td>-0.02</td> <td>0.09</td> <td>0.23</td> <td></td> <td></td> <td></td> <td>0.13</td> <td></td> <td>-0.05</td> <td>0.05</td> <td>0.27</td> | Y [| radices aislam esp. graderi | | | | 22 -0.08 | -0.15 | 0.00 | 0.08 | 0.29 | -0.03 | | 0.08 0.1 | -0.06 | | -0.14 | -0.02 | 0.09 | 0.23 | | | | 0.13 | | -0.05 | 0.05 | 0.27 |
| price A.2 A.2 </td <td>E</td> <td>radi os_ak km_mp_fans_k</td> <td></td> <td>0,03</td> <td>-0,07 0,</td> <td>16 -0,05</td> <td>-017</td> <td>Q.20</td> <td></td> <td>1.2</td> <td>0,10</td> <td>0,19 -</td> <td>0,17 0,1</td> <td>-0,22</td> <td>-0.05</td> <td>-0,13</td> <td>-0,05</td> <td>0, 22</td> <td>Q 33</td> <td></td> <td></td> <td>.04 -0.26</td> <td>0.18</td> <td></td> <td>-0,14</td> <td>0,01</td> <td>Q 31</td> | E | radi os_ak km_mp_fans_k | | 0,03 | -0,07 0, | 16 -0,05 | -017 | Q.20 | | 1.2 | 0,10 | 0,19 - | 0,17 0,1 | -0,22 | -0.05 | -0,13 | -0,05 | 0, 22 | Q 33 | | | .04 -0.26 | 0.18 | | -0,14 | 0,01 | Q 31 |
| 0 0 0.00 0.00 </td <td></td> <td></td> <td></td> <td>-0,17</td> <td>-0,17 -0,</td> <td>10 0,14</td> <td>Q12</td> <td>-q.02</td> <td>-0,05</td> <td>-0,02</td> <td>0,00</td> <td>-0,03</td> <td>0,03 -0,0</td> <td>1 D,D3</td> <td>Q 07</td> <td>0,08</td> <td>-0,09</td> <td>-0, 11</td> <td>q.00</td> <td>0,011 0</td> <td>ias a</td> <td>07 -qaa</td> <td>-0,17</td> <td>0,01</td> <td>0,03</td> <td>-0,09</td> <td>Q (12</td> | | | | -0,17 | -0,17 -0, | 10 0,14 | Q12 | -q.02 | -0,05 | -0,02 | 0,00 | -0,03 | 0,03 -0,0 | 1 D,D3 | Q 07 | 0,08 | -0,09 | -0, 11 | q.00 | 0,011 0 | ias a | 07 -qaa | -0,17 | 0,01 | 0,03 | -0,09 | Q (12 |
| P Unspecializes UB1 OB OB OB OB OB | - F | nation_ablem_control_agua | | | 0,00 -0, | 0 0,07 | d 00 | q11 | -0,00 | 0,02 | 0,05 | 0,14 | a, 15 a, 17 | -0,07 | -011 | 0,03 | 0,22 | 0, 10 | Q.20 | 0,15 0 | 11 0. | 03 Q18 | -0,05 | 0,01 | 0,13 | 0,07 | d da |
| 0 1 0 | 0 | _aucos_comparte | | | | | -001 | -002 | | | -0,09 | 0,00 | 0,05 0,05 | | 000 | 0,04 | 0.02 | 0,12 | 9.20 | 0.17 0 | 0- 00 | | -0,07 | -0,01 | 0,03 | | 012 |
| N Normal Conditional product Condit Conditional product | | | | | | | | | | | | 0.21 | | -0,10 | | | | | 0.24 | | 0 | | | 0,06 | 0,03 | .0.0 | -007 |
| 5 011 013 013 013 013 | N C | untos tot recos diatos | | 0.15 | 0.09 -0.0 | -0,05 | | | | 0.00 | | 0.07 | | -0.03 | 0.03 | 0.01 | 0.05 | 0.07 | | 0.23 0 | 01 0 | 01 011 | | 0.00 | 0.03 | -0.05 | -0.05 |
| 5 011 013 013 013 013 | 1 | arti da ación eventos | | -0.02 | 0,02 0,0 | 08 0,05 | -0.03 | 0.24 | 0,08 | 0,09 | 0.15 | 0.11 | 0,28 0,2 | 0.09 | -0.01 | 0,26 | 0,18 | 0,13 | 0.06 | 0,23 0 | 122 0 | 31 011 | 0.13 | 0, 19 | 0,07 | 0,05 | 0.05 |
| j | 5 | arti da acion provecto s | | 0.11 | | | 0.05 | | | -0.01 | | 0,19 | 0,19 0,11 | i 0,13 | | | 0.08 | | 0.03 | 0,20 0 | | | | -0,08 | -0,05 | 0,08 | 0.08 |
| r main plantain | S (| anal es_noved | | -0,06 | -0,04 0, | 05 0,10 | 00 p | qos | 0,03 | 0,08 | 0,00 | 0,21 | 0,25 0,1 | 0,19 | 9.23 | 0,22 | 0,02 | -0,25 | 9.00 | 0,21 0 | 19 0 | ADD- 100 | 0,02 | 0,09 | -0,07 | -0,01 | -q.06 |
| 1 0.08 0. | 1 | nos ganadero | | | 0,00 -0,1 | 05 0,10 | Q23 | -qas | | | -0,03 | | | | d 03 | -0,06 | | | -013 | 0,10 0 | 17 0 | 12 013 | | | | | Q 22 |
| 0 0.00 0. | T 8 | nos jexplotado n | | | | 22 -0,06 | -q14 | | | | | 0,25 - | | | | | | | | -0,09 0 | 102 -0, | 12 -0.14 | | | | | Q 312 |
| p purprisperin Cut1 | | | | 0,16 | 0,16 0,1 | | | | | 0,00 | | | | -0,06 | | | | | | 0,381 0 | ан <u>о</u> | 25 Q13 | 0,333 | | | | q 16 |
| 1 0.01 0.03 0.05 0.02 0.02 0.03 0.05 0.05 0.02 0.05 0. | 6 | red a confienda | | 0,10 | 0,22 0,1 | 05 0,02 | 0.28 | 005 | | 0.16 | | 0.22 | 0.12 0.0 | 0,17 | 0.12 | | -0,08 | 0,18 | 0.22 | 0,15 0 | 0,00 | 24 0.02 | 0,15 | 0,15 | 0,21 | 0,00 | -001 |
| N Mark OLAG OL | | | | | | | 012 | | | | | 0.04 | | | | | | | | 0.27 0 | 22 0 | 17 0.01 | | 0.28 | | | -0.03 |
| c dial di | N | una utilidad | | | 0,11 0,1 | 00 0.05 | 0.02 | 012 | | 0.11 | 0.07 | 0.25 | 0,15 0,2 | -0.05 | 010 | | 0.07 | 0,34 | | 0,42 0 | 137 0. | 25 015 | 0,30 | 0,12 | 0,17 | 0,19 | 013 |
| 5 Main Ma | 1 | nedia_utilidad | | 0,00 | 0,13 -0. | 05 0.05 | Q19 | -qos | | 0,35 | 0,00 | 0,07 | 0,05 0.0 | 0,13 | -0.06 | -0,03 | 0,00 | 0,25 | | 0,18 | 112 0 | 14 912 | 0,11 | 0, 20 | 0,24 | 0,03 | -0.00 |
| S Constrained Constraine Constrained Cons | - 8 E | fittent rear basies | | 0,19 | 0,08 0,0 | a 0,08 | -0.07 | 0.13 | 0,00 | -0,09 | | 0.19 - | | -0.13 | | | -0.03 | 0,06 | -0.15 | -0.08 -0 | 105 -0. | .06 -0.02 | 0,04 | 0,02 | -0,08 | | 0.36 |
| Discription Discription <thdiscription< th=""> <thdiscription< th=""></thdiscription<></thdiscription<> | - 8 - E | _venta_dineta | 1 | 0,03 | -0,13 -0, | 05 0,02 | -916 | 1, C2 | -0,09 | -0, Zi | 0,06 | 0.03 | 0,16 0,0 | -0,20 | -917 | | 0,35 | | Q 06 | | | 20 Q.01 | -0,01 | -0,08 | | | Q16 |
| p | F | _mme_ke | 100 C | 0,01 | | 05 0,05 | -d 05 | | -0,05 | -0, 25 | 0,11 | 0,10 | 0,15 0,1 | -0,12 | -9.01 | -0,08 | 0,21 | 0,20 | -0.06 | -0,02 -0 | | | | -0,08 | -0,03 | 0,08 | Q17 |
| Uncernal and and any and angle an | 0 1 | i co mora i produ chor 💦 🎽 | | 0,04 | | | 0.04 | | | 0.06 | 0,03 | -0,04 -0 | 0,08 -0,0 | 0,06 | | 0,09 | 0.09 | -0,09 | 0.09 | 0,02 -0 | 09 -0 | 13 012 | -0.06 | -0, 19 | | 4.0 | -017 |
| F Constraint Infract Out | | | | | | | | | | | | | | | | | | 0,18 | | | | | 0,19 | | | 0.12 | 0.32 |
| C Constraint | | | | 0.21 | | | | | | | | 0.02 | 0,00 0,1 | -0,05 | | | | 0.05 | | 0,04 0 | | | 0.12 | 0.01 | | 0.05 | 010 |
| P (mod with with with with with with with with | | | | 0.10 | 0.15 0.1 | -0.03 | -020 | 0.02 | | 0.20 | | -0.06 | 1.01 0.2 | -0,03 | | -0.05 | -0.11 | | -0.08 | 0.10 -0 | -0 | -403 | 0.16 | -0.02 | | | -0.01 |
| 0 program 0.01 0.03 0.03 0.01 0.05 0.01 0.04 0.00 0.03 0.01 0.01 0.02 0.02 0.01 0.01 0.02 0.02 0.01 0.01 0.02 0.02 0.01 0.01 0.02 0.02 0.01 0.01 0.02 0.01 0.02 0.02 0.01 0.01 0.02 0.02 0.01 0.01 0.02 0.02 0.02 0.01 0.01 0.02 0.02 0.01 0.01 0.02 0.02 0.01 0.01 0.02 0.02 0.02 0.01 0.02 0.02 0.02 0.01 0.02 0.02 0.02 0.01 0.02 0.02 0.02 0.02 0.03 0.01 0.02 <th< td=""><td>10</td><td>el atras sect</td><td></td><td></td><td></td><td></td><td>-011</td><td></td><td></td><td>0.5</td><td></td><td>0.06</td><td></td><td></td><td></td><td>-0.05</td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.06</td><td>0.08</td><td>0.04</td><td></td><td>0.14</td></th<> | 10 | el atras sect | | | | | -011 | | | 0.5 | | 0.06 | | | | -0.05 | | | | | | | 0.06 | 0.08 | 0.04 | | 0.14 |
| 0 0 0.05 0.08 0.00 0.13 0.08 0.01 0.02 0.11 0.02 0.01 0.02 0.01 0.01 0.02 0.01 0.02 0.01 0.02 0.01 0.02 0.01 0.01 0.02 0.01< | 0 | rea protesi da | | | | | | | | 0.14 | | 0.14 | | | | | -0.07 | | | | | | 0.29 | 0.13 | -0.10 | 0,10 | 0.25 |
| A meripatree 0.05 -0.04 0.28 -0.01 0.12 0.15 0.07 0.23 0.13 0.01 0.12 0.02 0.13 0.02 0.03 0.13 0.01 0.02 0.01 0.01 0.01 0.01 0.02 0.04 0.05 0.01 0.02 0.03 0.01 0.02 0.01 | 8 | sup diente | | | | | | | | | | 0.11 4 | | | | | | | | | | | | 0.11 | -0.13 | 0.01 | 014 |
| C transformation (2017) | A | nese s pastoreo | | 0,05 | | | | 0.08 | | | | 0,25 - | | | | | -0,04 | | | | | | | | -0,07 | 0,20 | Q 36 |
| | C 8 | pastos naturales | | 0.10 | -0,12 0,1 | 05 -0,08 | -016 | 0.14 | 0,29 | 0.15 | 0,16 | 0,13 4 | 0.07 0.1 | -0.07 | -0.06 | -0.15 | 0,09 | 0,10 | -0.26 | -0.12 -0 | 08 -0 | 07 0.01 | 0,12 | 0,02 | | 0,02 | 0.19 |
| * | K E | agua pozios manan Tuvia | | 0.01 | | G2 0,01 | | 0.00 | -0,05 | | 0.07 | 0,06 | 0.05 -0.0 | 0.17 | -0.03 | 0,06 | 0,05 | -0.08 | -0.10 | -0.06 0 | 104 0. | 01 0.05 | -0,13 | -0,08 | 0,01 | -0,08 | -0.16 |
| p.m.bms) 0.05 -0.13 0.00 0.04 0.05 -0.01 0.04 0.05 -0.06 0.07 -0.05 0.01 0.05 0.01 0.05 0.02 0.01 0.04 0.17 -0.02 0.04 0.03 -0.03 | 8 y | n enjajeno vje | | 0,28 | 0,14 0, | 09 0,08 | -q10 | Q11 | 0,08 | -0,07 | 0,14 | 0,14 - | 0,02 0,1 | -0,04 | -0.05 | 0,02 | 0,04 | -0, 17 | -9.02 | 0,01 -q | 102 -0, | on daa | 0,09 | -0, 01 | -0,08 | 0,07 | -0.06 |
| | F | _es tierco l | | uus. | -0,13 0, | 00,00 | Q04 | -qas | -0,11 | 4,00 | -0,09 | -0,04 | u,s -0,0 | 0,08 | Q07 | -4,05 | -0,01 | 0,05 | -403 | ud2 0 | 101 U | .04 -017 | -0,02 | 0,04 | -0,15 | -0,05 | 406 |







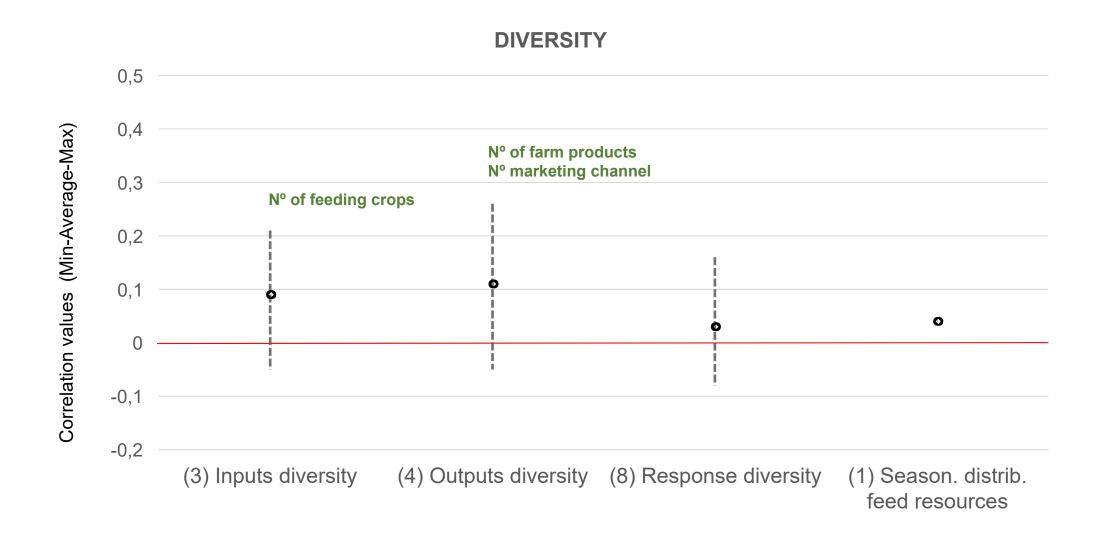
SYSTEM RESERVES







Results

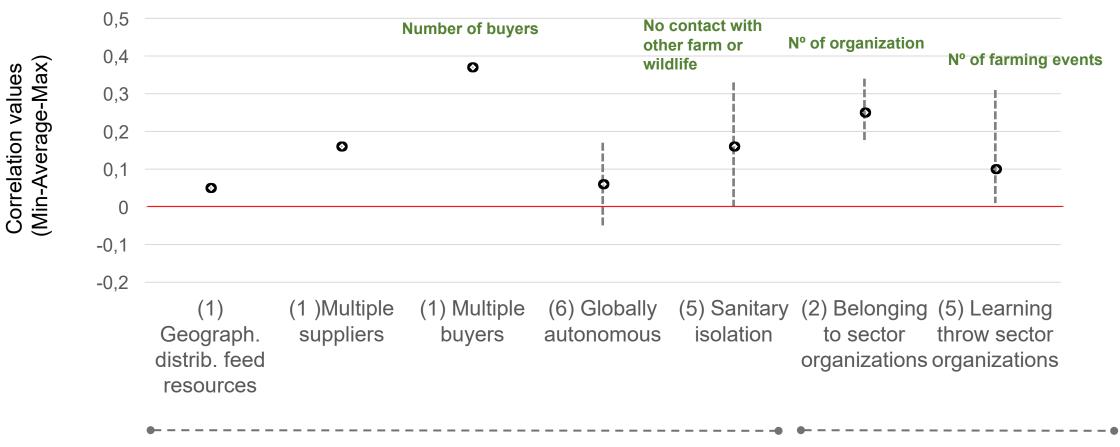








MODULARITY & OPENNESS



MODULARITY

OPENNESS







Percentage of natural 0,4 **Trust, participation** pastures **and utility in** associations 0,3 (Min-Average-Max) Correlation values 0,2 Years as farmer φ ۲ 0,1 0 \cap -0,1 0 -0,2 (3) Learning (2) (1) Local (1) Negative (5) Coupled (3) Local (1) with natural through Overcome support of support of Environment impact on the informal difficulties other other state of resources networks conservation environment farmers economic sectors

TIGHNESS OF FEEDBACKS

Results







- In most cases, there is a positive correlation between self-assessment and objective indicators...
- This correlation is far from being strong, and vary across attributes.
- The clearest alignment (0,3/0,4) is found in attributes of natural, social capital, infrastructures, openness, learning through networks, and couple with natural resources.
- The highest discrepancy (-0,1/-0,2) is found in human capital, and state of conservation of environment.



Conclusions



- Results suggests that the two types of measures are not interchangeable.
- Two ways of inferring resilience, which approximates better to "true" resilience?
- The choice of measuring approach should be done with care.
- Merits and limitation of different approaches should be made fully transparent.

COMPARISON OF SELF-ASSESSMENT AND OBJECTIVE INDICATORS OF ATTRIBUTES DRIVING FARMS RESILIENCE







