How to improve resilience,

from animal to system level

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Threats to resilience

- Disease Outbreaks
- Climate Change, feed, water scarcity or excess
- Market Fluctuations
- Limited Genetic Diversity and lack of resilient breeds and varieties
- Environmental Degradation, Invasive Species and Pests
- Conflict and Displacement
- Policy and Regulatory Issues
- Lack of Knowledge and Training
- Limited Access to Veterinary Care
- Market and Value Chain Challenges
- Social and Cultural Changes (Rapid urbanization and changing cultural norms)

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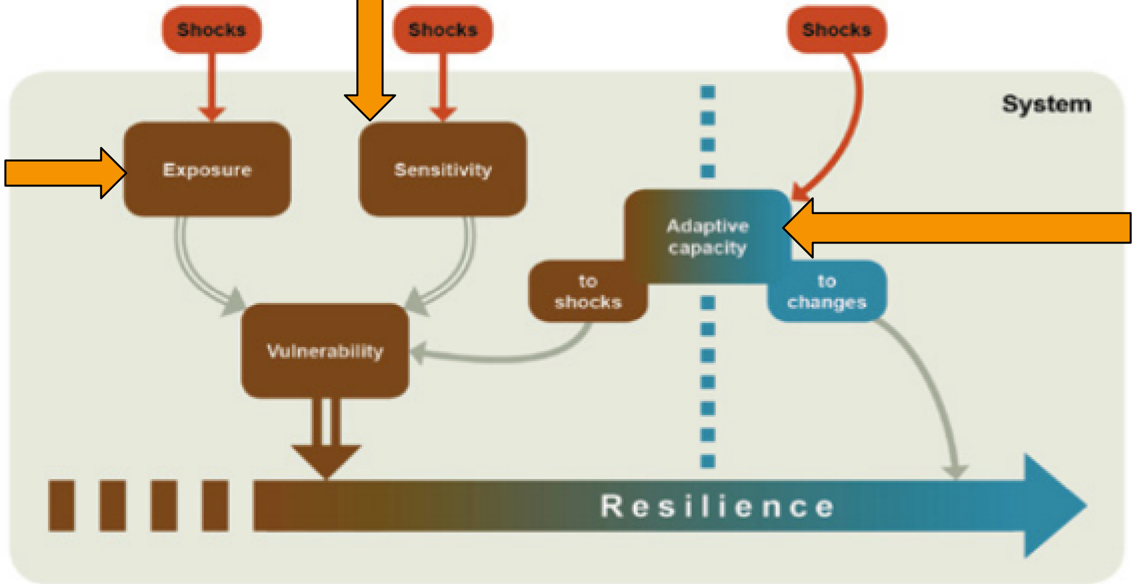
Resilience: exposure, sensitivity and adaptive capacity

- Breed
- Housing system
- Feeding system

- Animal health risk (vaccination rate, level of biosecurity etc.)
- Value to household (livelihoods, food security etc.)

- Duration
- Frequency
- Severity
- Location of stock
- Location of relevant assets (feedstock, housing, water points etc.)

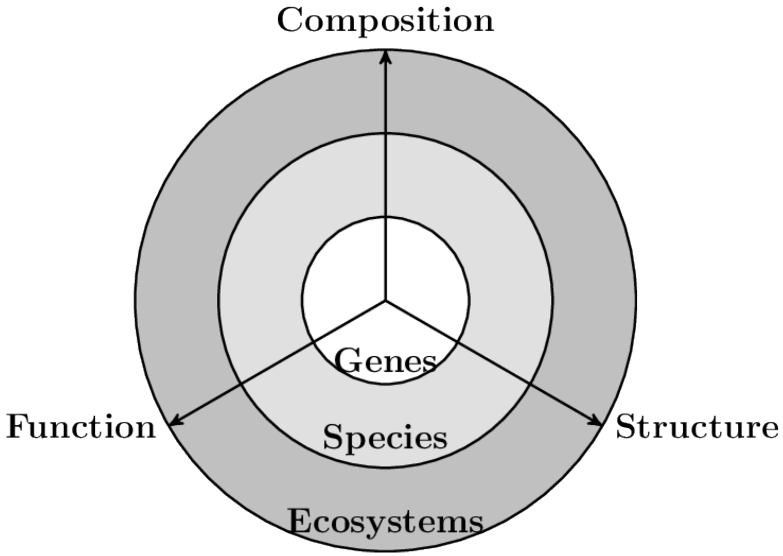


- Species/breeds
- Availability/adaptatbility alternate feed resources
- Production system
- Accessibility of animals (health/extension services)
- Outbreak response (surveillance, compensation schemes etc.)
- Household wealth status

FAO/OECD, 2012

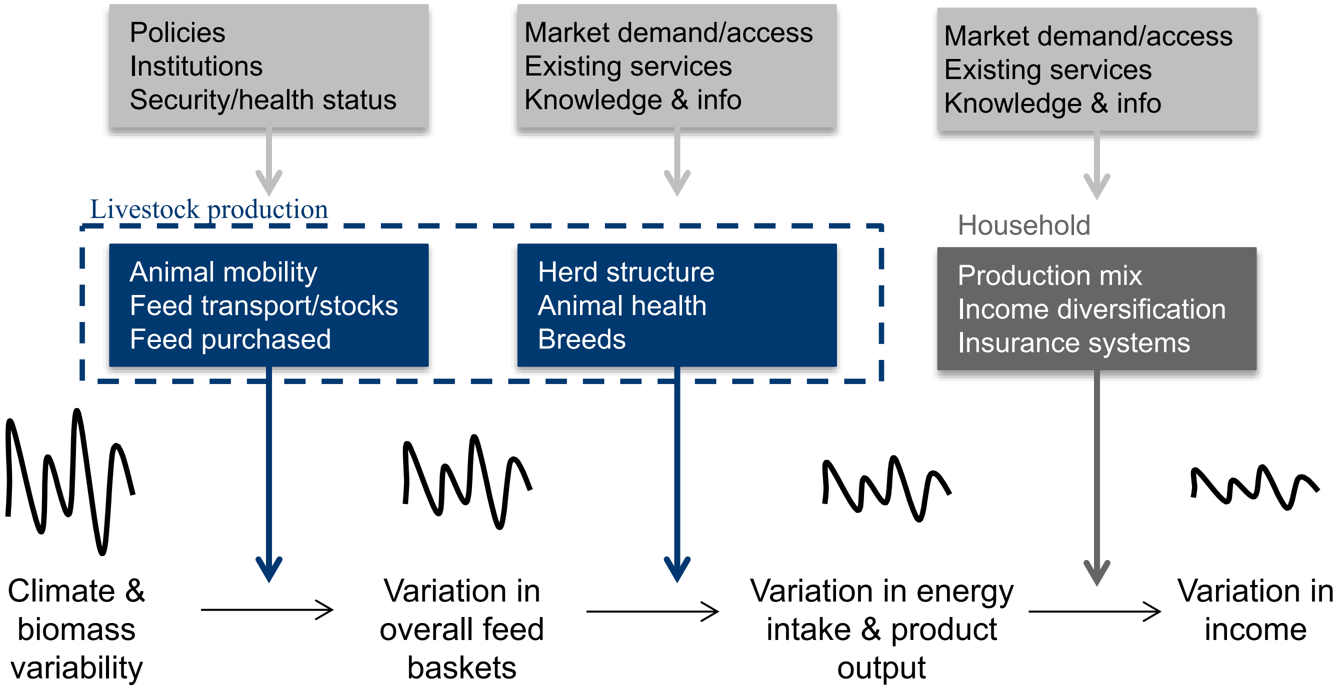
Biodiversity and climate change adaptation at 3 levels

- **Genes**: diversity provided by animal genetic resources key for adaptation to harsh conditions and resilience to extreme climatic events and diseases. Needs to be sustainably managed (27% of breeds at risk of extinction)
- **Species**: shift to small ruminant species and camelids in arid areas. Impact through feed: drought resistant fodder species, varieties and mixes are key
- **Ecosystems**: only healthy ecosystems can provide services that are essential to livestock production, even more so in the context of climate change (biomass production, water provision, disease regulation…)



Main levels and dimensions of biodiversity

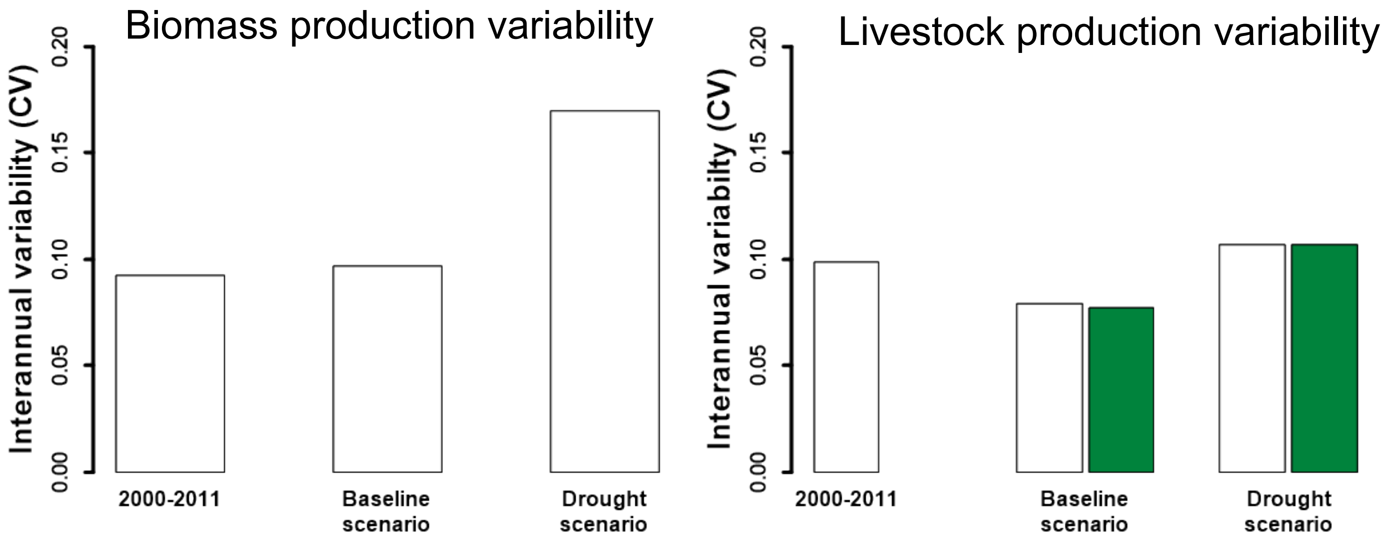
Livestock are a form of adaptation: Attenuation of the effect of climate variability on herd performances



FAO, 2016. Climate change and food security: risks and responses

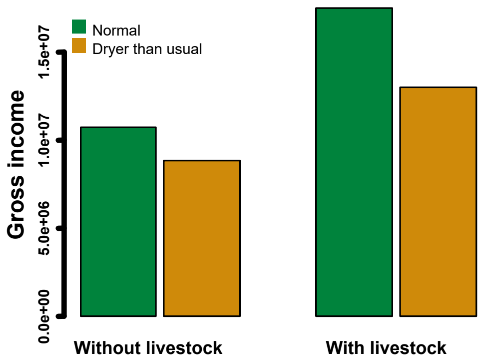
Example: Lower variability of livestock production compared to biomass availability in Zambia

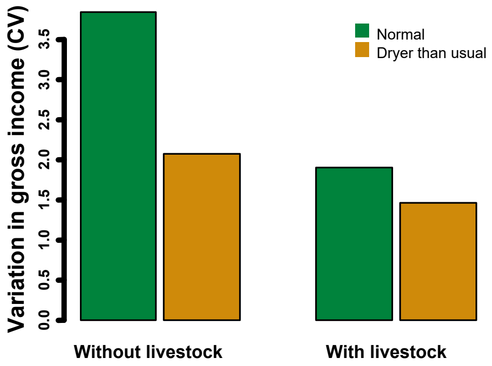
- Especially in the drought scenario
- More reduction when including market stratification as improvement



(Mottet et al., 2017, GGAA)

Example: Impact of improved production practices on adaptation in Zambia





- Higher income in farms with livestock, including in dry years
- Lower income variation across farms, in farms with livestock

(Mottet et al., 2017, GGAA)

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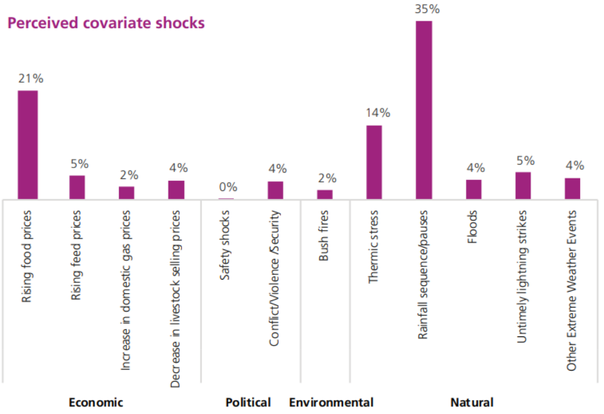
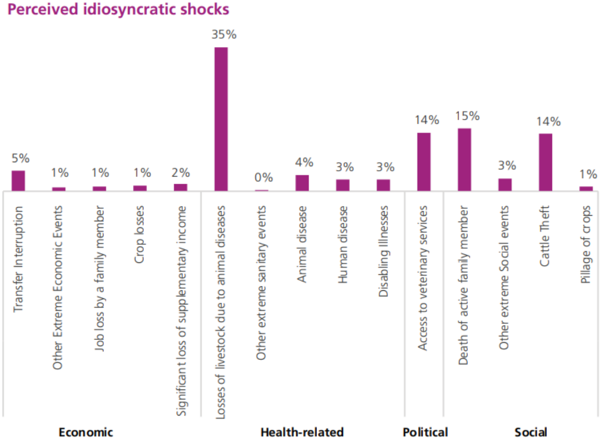
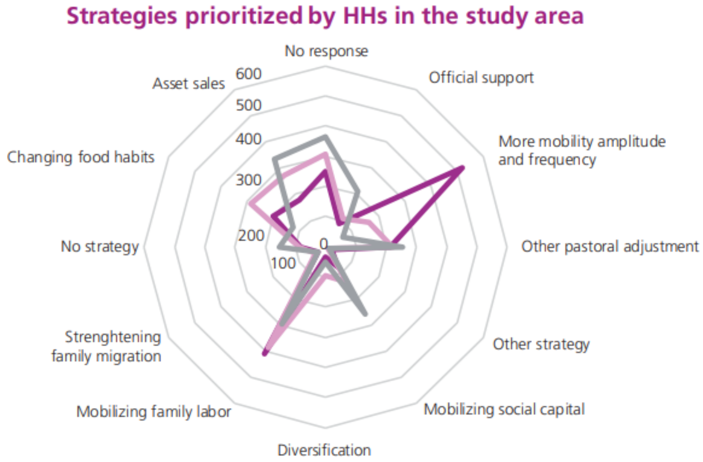
Economics of pastoralism

In Argentina, pastoral and agropastoral households report that most of the multifaceted shocks they are facing affect the whole pastoral sector (78%) rather than the household level (22%)



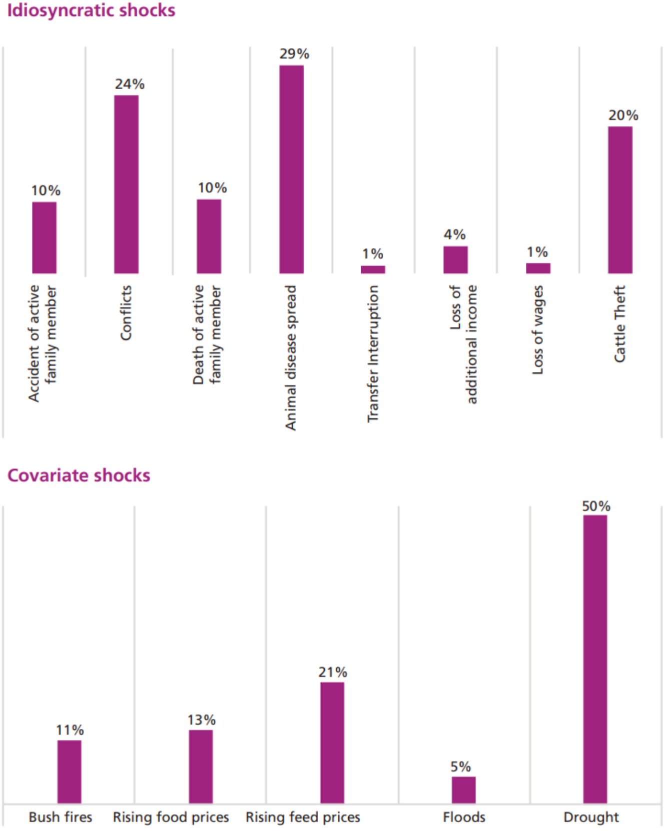


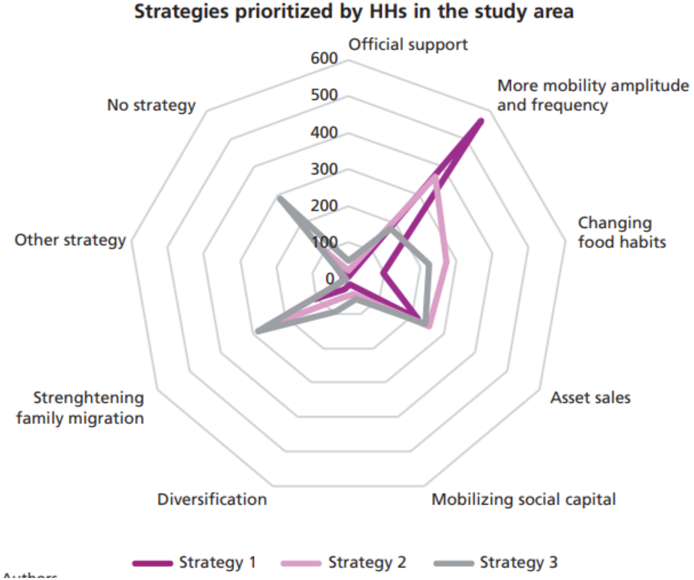
Perceived shocks in the study area and prioritized strategies (Wane A., et al., 2020)



Economics of pastoralism

In Chad, idiosyncratic shocks account for 51% of the total, versus 43% for covariate shocks and the remaining 6% are to a combination of various shocks.

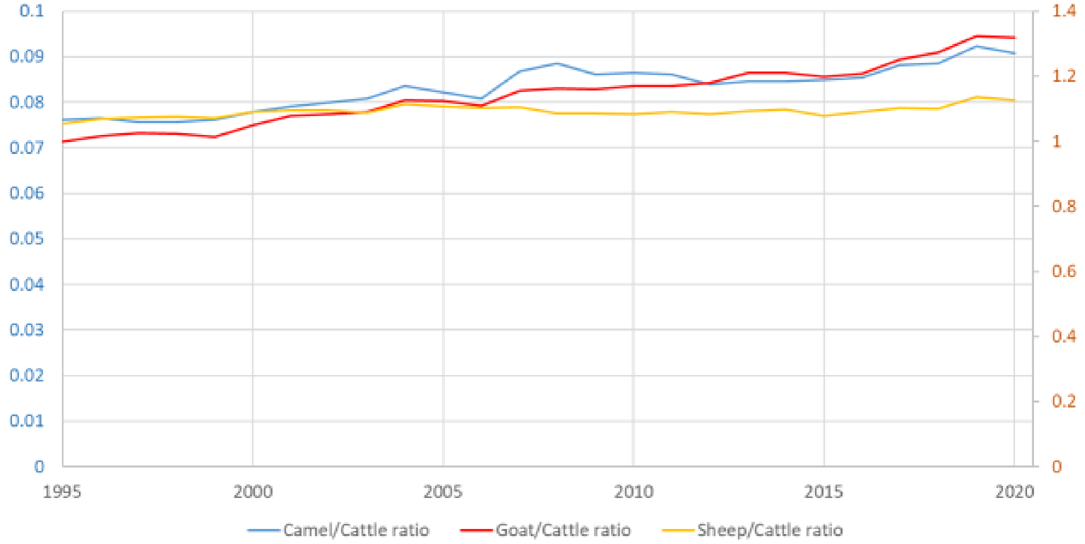




Perceived shocks in the study area and priorotized strategies (Wane A., et al., 2020)

Genetic solutions: Choice of populations/breeds/species for increased resilience

- Shift to locally adapted breeds or crossbreds between local and exotic
- Shift to more resilient species (from cattle to camel or small ruminants) FAOSTAT data



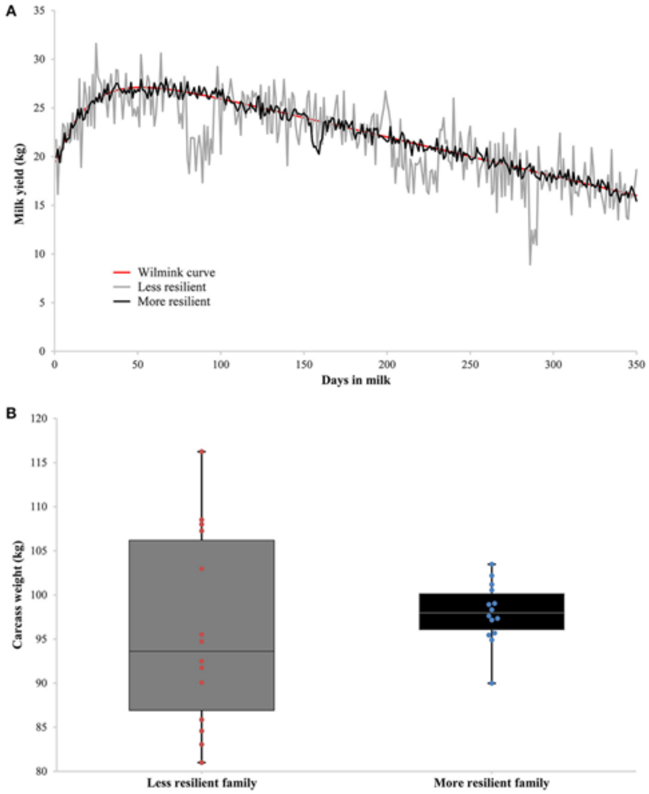
% of Holstein genes	Milk yield (kg)	Somatic cell score	Milk fat to protein ratio (%)
<87.5%	0.02	0.00	0.00
87.5-93.6%	-0.03	0.04	-0.01
>93.7%	-0.08	0.07	-0.05

Rates of declines in milk traits as function of THI index in Thai dairy cattle with ssGBLUP model (Sungkhapreecha et al. 2022)

Genetic solutions: Breeding for increased resilience

General resilience indicators

- Fluctuations of selected traits within a usual set of environmental conditions, e.g.: variance, autocorrelation or skewness of production traits
- Economic value of resilience on farms, where labour time is restricted (large farms)
- Significant genetic correlation between resilience traits and milk yield response to heat wave (Poppe et al. 2021)
  - ➢ *Resilience to micro- and macro environmental disturbances have a common genetic background*



Production traits suitable for investigating resilience (Berghof et al. 2019)

Public policies to increase resilience

Social protection mechanisms:

- Cash transfers
- School meals
- Insurances

Disaster risk reduction and management (DRRM) for example:

- disease prevention and outbreak containment plans
- early warning systems (for example drought monitoring, Feed Balance Sheets)

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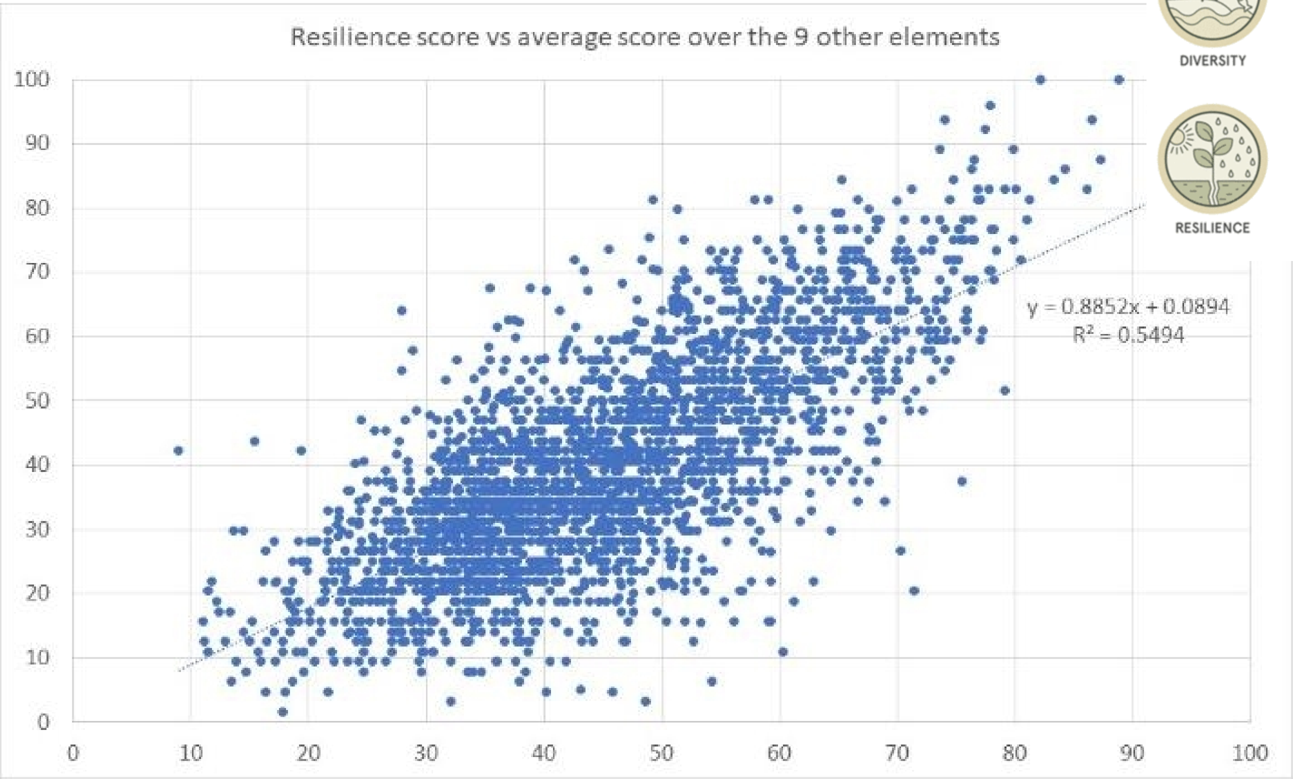
Agroecology, an approach to build resilience at all levels

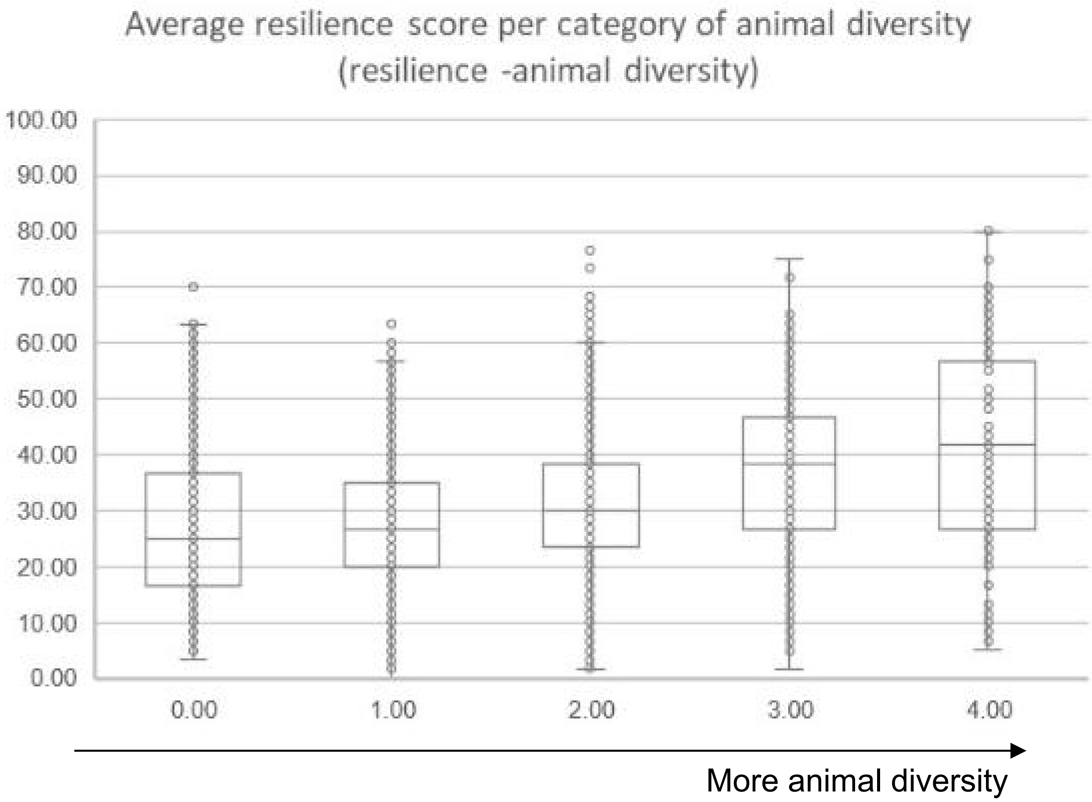


- Data from c.a. 3,000 farms in 9 countries of Sub-Saharan Africa from the FAO Tool for Agroecology Performance Evaluation
- Free and on-line, 20+ languages, Kobo Toolbox

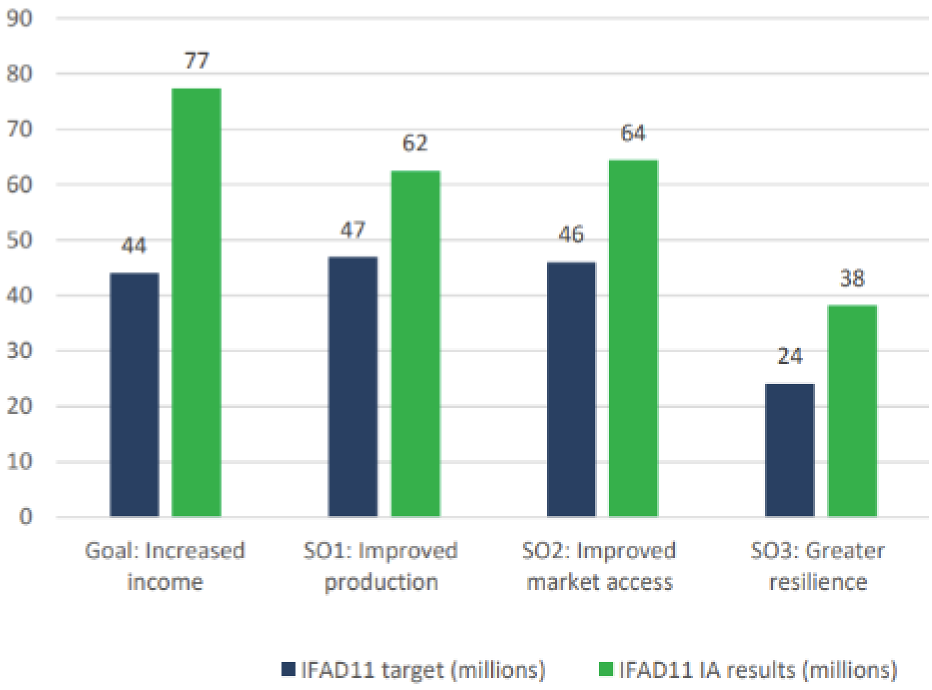
Farms with higher animal diversity have higher scores of resilience

Resilience measured by:

- Stability of income/production + capacity to recover
- Existence of social mechanisms to reduce vulnerability
- Environmental resilience + capacity to adapt to climate change
- Diversity of production and sources of incomes



Upscale these solutions:
Impact of IFAD's investments on resilience



Impact assessment 2019-2021:
96 projects, total US$7.1 billion, reached 112 M people

Income gains were particularly large in countries with livestock projects

Higher market access increases in Kyrgyzstan, Pakistan and Tunisia, which were all livestock projects

Indicator for resilience captures households' ability to recover from any shocks. Indicator was specific to the type of intervention
https://www.ifad.org/ifad-impact-assessment-report-2021/index.html

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Example of adoption of adaptation options in 3 IFAD investments in livestock

Impacts of adopting adaptation options in ASAP projects

Country	*Project*	*Focus*	*Indicator*	*Impact (pp)*	*Counter-factual*
Kyrgyzstan	Livestock and Market Development Programme II	Enhance livestock productivity and strengthen the climate resilience of pasture communities	Follow rotational plan	-37***	61
			Use remote pasture	65***	22
			Does not use winter pasture	28***	15
			Does not use spring pasture	69***	13
Nicaragua	Adapting to Markets and Climate Change Project	Adaptation to climate change to increase production. Connect farmers to market and access to market	Crop residues	-3**	96
			Shade trees	6**	73
			Water infrastructure	7**	42
			Post harvest infrastructure	63***	37
Tajikistan	Livestock and Pasture Development Project II	Enhance livestock productivity and strengthen the climate resilience of pasture communities	Tropical livestock unit (%)	-29*	3.3
			Rotational plans for pasture	52***	34
			Protected rangelands	21***	3
			Winter stalls	23***	70
			Water points	19**	20

Source: IFAD11 impact assessment reports, forthcoming.

Impacts are reported in percentage point changes for all indicators except for the tropical livestock unit (Tajikistan) where the impacts are in percentages. The counterfactual values are in percentages except for the above-mentioned indicators expressed in their original continuous values. The counterfactual values represent what beneficiary households would have had if they had not benefited from the respective project. Asterisks indicate the level of statistical significance: * at 10 per cent; ** at 5 per cent; *** at 1 per cent.

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Conclusions

- Resilience can be built by reducing exposure (e.g. move to another area), reducing sensitivity (e.g. diversification) and increase adaptive capacity (e.g. training on disease surveillance)
- Resilience can be built at all levels, from animal to social system, but it always requires locally specific options
- The presence and diversity of livestock seem to make systems more resilient (e.g. Zambia and SSA)
- Increase resilience is one of the main impacts measured from IFAD's investments

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