Summer School Agrobiodiversity

zh aw

FiBL

Mini Case Studies

2025

Species-Level Agrobiodiversity in Crops and Livestock Systems

Agrobiodiversity in Traditional Rice Farming Systems – A Case from Camarines Sur, Philippines

Ralph Carlo Evidente[1, 2] & Michelle Almendrala [2]
[1] BOKU University, Austria [2] Mapúa University, Philippines

Map of Camarines

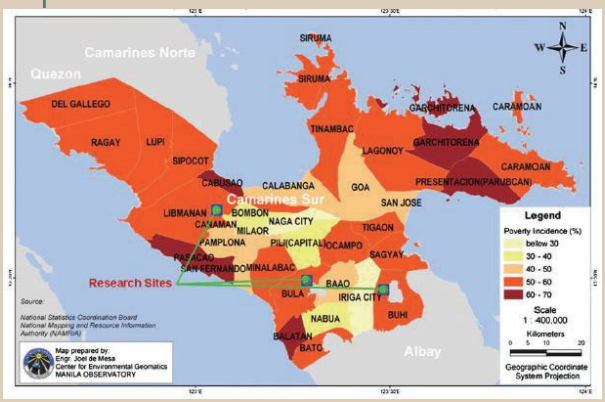


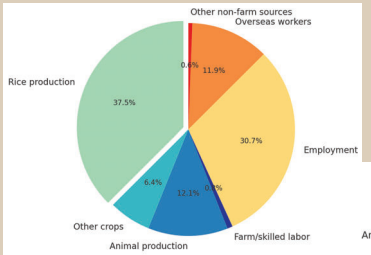
Figure 1: *Map of Camarines Sur showing absolute poverty incidence (2000). The research study are based on* Data based on a household survey of 60 rice-farming families across three villages in Camarines Sur (Santo Domingo, Mandacanan, and Igbac). *These locations highlight socioeconomic vulnerability and the need for sustainable, biodiversity-based rice farming practices (Source: Manila Observatory)*

Ecological Processes

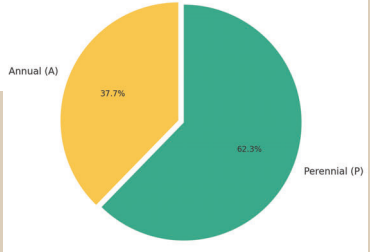
Natural pest regulation in action:
🌾 *Diverse vegetation* supports habitat for 🕷️ *beneficial predators* like Tetragnathidae spiders, which reduce rice pests. This leads to 🍚 *healthy rice harvests* and 👨‍🌾 *greater food security for farmers.*

Ducks and goats help manage pests and weeds, while carabaos (water buffaloes) provide labor and manure. Livestock contribute to food, income, and nutrient cycling within the rice ecosystem.

Key Insights and Implications



Biodiversity matters, but so does economic strategy. Left chart shows why smallholders **don't rely on rice alone**.



Agrobiodiversity as a **climate-resilient strategy**, not just a cultural one.

References

Alejos, S. F., Pajaro, M., Raquino, M., Stuart, A., & Watts, P. (2021). Agricultural biodiversity and coastal food systems: a socio-ecological and trans-ecosystem case study in Aurora Province, Philippines. Asian Journal of Agriculture and Development, 18(2), 74-84.

Species-Level Agrobiodiversity in Crops-Livestock System

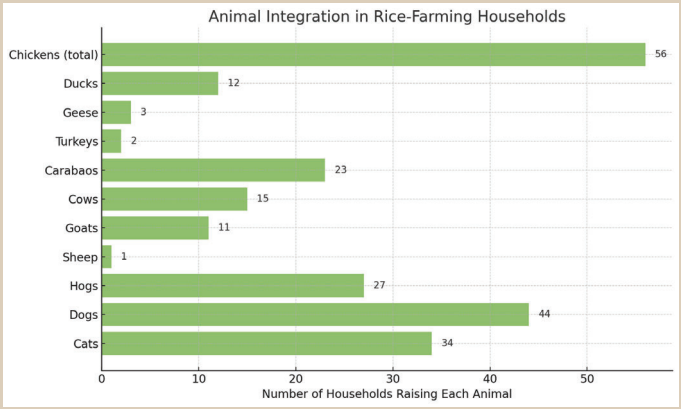


Figure 2: *Species diversity among livestock: Chickens (dual-purpose, fighting, free-range), goats, ducks, and carabaos form a multifunctional animal system that supports food, fertility, and pest control.*

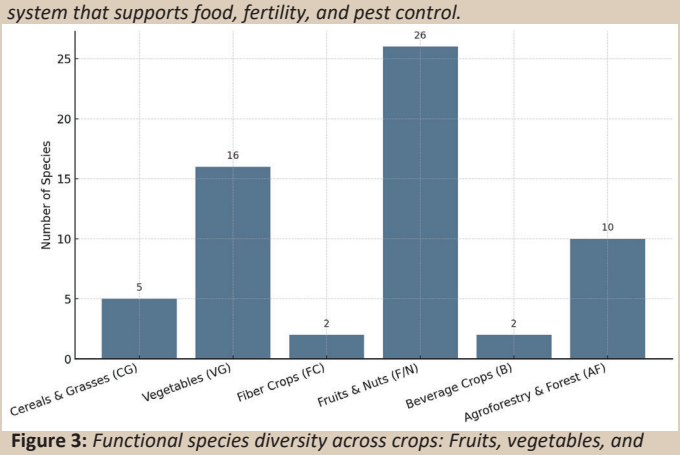


Figure 3: *Functional species diversity across crops: Fruits, vegetables, and agroforestry trees dominate, supporting dietary diversity, soil health, and year-round productivity.*

Community-led training on carbonized rice hull (CRH) production for organic farming, conducted by the Rinconada Movement for Sustainable Agriculture and Environmental Management (Rinco-MESA). CRH serves as a low-cost soil amendment, enhancing nutrient retention and circular resource use.

Take-Home Points

Summerschool Agrobiodiversity | Case “Saatzucht Rose”
presented by Lea Doobe, lea.doobe@fh-erfurt.de

FACHHOCHSCHULE ERFURT UNIVERSITY OF APPLIED SCIENCES

IN FULL BLOOM

ORGANIC BREEDING, SEED PROPAGATION, AND REGIONALLY ADAPTATED WILD FLOWERS

>>The diversity of crops keeps the farm stable.<< ANNEGRET ROSE

Above: Fields and farm buildings of Saatzucht Rose. Photo: Lea Doobe
Below: Field Hamster. Photo: Naturschutzbund Österreich

Saatzucht Rose in Erfurt: A pioneer in organic seed propagation

+ Species diversity within crops and lifestock
+ Biodiversity of agricultural lands

In total, Saatzucht Rose cultivates over 200 species and varieties. Not only herbs and vegetables like oregano, peppers and cucumbers, but also fields of bread spelt (not for seed production), lovage, flaming love, delphinium and - as a highlight - fields full of peonies, which are a local attraction when in full bloom. For seed production, minimum distances must be maintained between the varieties for many crops in order to avoid cross-pollination. As a result, each crop is only grown on a small area, with many positive effects:

- Reduction of pathogen pressure on organically farmed land
- Crop-diversity promotes economical resilience
- Small-scale structure of the farm serves as habitat for endangered species like field hamster

Heterogeneous growth of bush beans in the Phaseolus-project. Photo: Lea Doobe

Pre-breeding for an organically bred bush bean

+ Genetic diversity of crops and lifestock

On the land of Saatzucht Rose, the *Phaseolus*-project aims to identify suitable breeding objectives and possible variety parents for an organically bred bush bean used as dry bean. Trials are conducted to test which variety copes well under which conditions, which can be harvested and threshed easily and which delivers high and stable yields. The most suitable beans shall then be used as variety parents for the organic breeding of a new variety, which wll increase the genetic diversity of bush beans. One of the aims is also to identify the drought-tolerant lines.

Organic RegioSaat project: Organically propagated seed for flower strips

+ Biodiversity of agricultural lands
+ Genetic diversity of crops and lifestock

Another project is called "*RegioSaat: Regional wild seed mixtures for flowering areas and field margins in Thuringia*". It develops and tests organically propagated seed mixtures of local wild flowers for flower strips. Farmers can apply for subsidies for the cultivation of these strips, but lack of seed from organic propagation is a problem: Currently special permits have to be obtained individually for each species, which is an enormous bureaucratic effort. The project aims to create a regional supply of organically propagated wild seeds (mixtures) for Thuringian agriculture. The flowering mixtures are optimised on the basis of cultivation trials and coordinated with nature conservation representatives. The plant selection also focuses on a positive effect on beneficial insects and a phytosanitary effect on the soil.

The project has been running since 2021 and will end this year. The mixtures are currently being tested on four different sites and the data is being analysed. The developed mixtures consist of up to 20 perennial wild plants, which ideally remain and develop on the sites for several years. The regional adaptation of the species is of course also reflected genetically.

Flower mixtures from the RegioSaat project in full bloom. Photo: Lea Doobe

References:
- *lfl. (2024). Ökologische Züchtung von Buschbohnen als Körnerdruschfrucht im Projekt PHASEOLUS. https://www.lfl.bayern.de/iab/landbau/370915/index.php-*
- *Rose Saatzucht. (2021). Projekt: REGIO-SAAT // Regionale Wildsamenmischungen für Blühflächen und Feldsäume in Thüringen. Rose Saatzucht Erfurt. https://rose-saatzucht.de/projekt-regio-saat-regionale-wildsamenmischung-fuer-bluehflaechen-und-feldsaeume-in-thueringen/*

Is another type of farm possible?

-Andrea Bedogni-

Introduction

Marco Tasin owns a small farm called “Mani in Terra” in the Alps, in Trentino region. He has an interesting background as a professor in Plant Protection and Agroecology in Sweden. He also aims to prove that it is possible to convert an apple farm into a more sustainable and agroecological one.

Marco Tasin in his field

Key aspects in agrobiodiversity

Local horticolture landraces, resistant fruit trees, bug hotel

Companion planting, usage of various species in the field

Agro-ecological system

Minimum soil tillage, no chemical pesticide

Local vegetables, local fruits, fruit juices

Various customers

A typical raised bed in his farm

He has a different idea of business:

- He sells healthy food without chemical pesticide residues.
- He **trains other farmers** to either convert their farms or to improve their agricultural practices.
- He provides **consulting for agro-ecological** systems

Conclusion

Marco Tasin is the focal point of this case study, that takes his work as a base to delve further into sustainable and agro-ecological farms as an innovative way of cultivation, thus proving that other types of non-traditional farming are possible.

Companion planting

E-mail: andrea.bedogni@studenti.unipd.it

References: Interview with Marco Tasin, website of his farm https://maninterra.it/

August 2025

BRINGING SCOTTISH GRAIN BACK TO ITS ROOTS

Agrobiodiversity Summer School 2025

Anna Komendantskaya
A.Komendantskaya@sms.ed.ac.uk

University of Edinburgh

With special thanks to Andrew Whitley, cofounder and project coordinator for Scotland the Bread.

INTRODUCTION

Scotland the Bread is a member-owned Community Benefit Society uniting wheat growing, flour milling, distribution and bread-making processes into one local supply chain. At their farm in Fife they are reintroducing nutrient-rich Scottish heritage grains. Their mill works in small batches, producing flour to sell as wholesale and retail. Their work also involves campaigning, citizen outreach and research into grain nutrient profiles.[1]

Above: the site at Balkaskie Estate Farm.

Bottom right of poster: innovative Zentrofan flour mill.

BACKGROUND

Scottish farming is traditionally known for climate-resilient heritage grains and use of crop cycling techniques.

Although most (85%) of the UK's wheat is grown within the UK,[4] Scotland's wheat is now more likely to have travelled from England and Wales, where previously it was supplied by local farmers growing 'heritage' grains developed by selective breeding since the 18th Century, proven to contain higher quantities of iron, copper, zinc and manganese.[5]

There is increasing reliance on imported wheat and barley Canada and Germany, seen as higher-quality producers.[2]

Wheat grown in the UK has veered towards protein-rich, micronutrient deficient monocultures. These are low-cost and high yield, easily milled into flour for ultra processed and preservative-heavy bread. Scotland the Bread tries to combat this; nutrient deficiency linked to over-processed food has been proven a risk by UK National Institutes of Health.[7]

OBJECTIVES

- Reintroduce nutrient-rich, climate resilient Heritage grains to Scottish agriculture.
- Create a holistic supply chain, from wheat growing to flour milling and distribution, all occurring on one site.
- Use energy-efficient small batch milling technology – this involves an air-pumped Zentrofan mill, the first of its kind to be used in the UK.[1]
- Sell flour to local bakers and stockists.
- Reduce transport emissions by joining onto the existing delivery routes of local bakeries.
- Collaborate with academic research groups to test the nutrient content of their grains – and use this research to argue for the benefits of consuming whole grains.
- Community outreach initiatives which raise awareness in schools and community centres, teaching about sourdough cultivation and the value of nutritious grain.

DIVERSITY OF STAKEHOLDERS

This non-profit organisation also works closely with stakeholders throughout the entire food system;

- **Landowners** of Balkaskie Estate, where they farm
- **Millers and staff** (project coordinator, communications).
- **Customers** (individual subscribers, local bakers, wholesalers).
- **430 member shareholders.**
- **Researchers** at James Hutton Institute, Rowett Institute.

PROMOTING AGROBIODIVERSITY

Genetic diversity of crops and livestock

Different species of Scottish heritage grain are grown on the site;

- **Wheat varieties:** Rouge d'Ecosse, Golden Drop and Hunter's wheat are descended from native Scottish landraces selectively bred since 1810. They are known for their resilience and resistance to snapping in periods of frost, extreme cold and wind.
- **Fulltofta Evolutionary Rye:** known for a high degree of genetic diversity from plant to plant. Rye is a 'cover crop' which protects the soil surface. It also diversifies the product range to be sold.

Biodiversity of agricultural land

The site at employs crop and livestock cycling, alternating growth of vegetables, potatoes, cereals, and both breeding/fattening livestock. The topography of the site varies from hilltop to coastal, so land use is decided according to land type.

Diversity of production & food supply systems

The organisation offers the option to buy flour directly but also distributes to local bakeries and stockists. This creates multiple pathways by which organic flour can reach the community in the form of baked goods.

CHALLENGES

Low crop yield: Given the small scale of the site, wheat production can only happen at a slow rate, so Scotland the Bread has struggled with making a return on shareholder investments.

Lack of consumer demand: With rising costs of living in the UK, consumers are less inclined to prioritise nutrient-rich, local grain if that comes at a higher cost than traditional bread flour or mass-produced bread. Little importance is placed on high-quality bread within modern British culture, so cost and convenience govern which breads and flours are chosen by consumers.

CONCLUSIONS

Though their business model is low-yield, Scotland the Bread sets a prime example for sustainable wheat production within their local community and research environment. For this model to become scalable to a national level would require more rigorous government investment and policy support.

REFERENCES

[1] Scotland The Bread. (n.d.). Scotland The Bread. [online] Available at: https://scotlandthebread.org/.

[2] Ahdb.org.uk. (2019). *UK trade data | AHDB*. [online] Available at: https://ahdb.org.uk/cereals-oilseeds/trade-data.

[3] *Record wheat imports so far this season: Grain market daily | AHDB* (2025) *Ahdb.org.uk*. Available at: https://ahdb.org.uk/news/firm-maize-and-wheat-imports-so-far-grain-market-daily.

[4] UK Flour Millers. (n.d.). Imports & Exports: Wheat & Flour. [online] Available at: https://www.ukflourmillers.org/importsexports.

[5] Earthtalks.ucd.ie. (2022). Climate resilience and heritage grains: interdisciplinary approaches to sustainable agronomy – Earth Talks. [online] Available at: https://earthtalks.ucd.ie/sonia-negrao/ [Accessed 10 Jul. 2025].

[6] Hernandez-Soriano, M.C., Warren, F.J., Hildebrand, F., Wingen, L.U., Miller, A.J. and Griffiths, S. (2025). Unearthing the rhizosphere microbiome recruited by ancestral bread wheat landraces. doi:https://doi.org/10.1101/2025.05.08.652585.

[7] Martini, D., Godos, J., Bonaccio, M., Vitaglione, P. and Grosso, G. (2021). Ultra-Processed Foods and Nutritional Dietary Profile: A Meta-Analysis of Nationally Representative Samples. *Nutrients*, [online] 13(10), p.3390. doi:https://doi.org/10.3390/nu13103390.

Cultivating Autonomy

A Long Journey Toward Food Self-Reliance

Introduction

This case follows the shift of a former fine-dining chef to a small, diversified farm in the Roman countryside. Guided by permaculture, it blends heritage orchards, vegetables, olives, bees and small livestock to pursue food self-reliance, soil regeneration and short value chains. The work unfolds on steep land and under health constraints, amid wildlife pressure and limited access to public grants. A true resilient, community-rooted model rather than a scale-driven one.

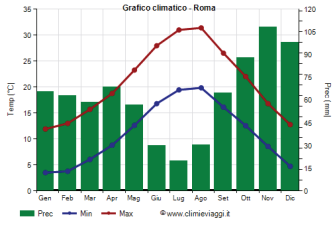
Study Area: Geography and Landscape

The farm sits about 30 km north of Rome (Lazio, Italy), on the foothills of the Sabatino volcanic complex. The 4-hectare site occupies an east–southeast facing slope with an average inclination of ~30°. Soils derive predominantly from pyroclastic bedrock: tuff and pozzolana

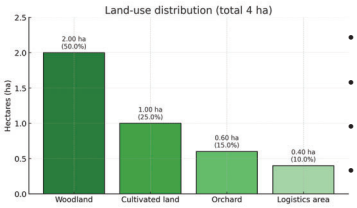
The countryside north of Rome, within the Veio Park area, is marked by tuff hills cut by a dense network of “forre”-narrow, deep gorges carved by water into the tuff. The result is a mosaic of oak woodlands, croplands, and pastures, with the gorge slopes acting as ecological corridors and hosting cooler, more humid microhabitats.

Climate

Rome’s thermo-pluviometric diagram indicates a Mediterranean climate (Csa): hot, dry summers and mild, wet winters. Rain peaks in autumn (with a smaller spring rise) and is minimal June–August. Annual means of ~16 °C and ~900 mm highlight strong seasonality with summer drought and cool-season recharge.



Land-use and Land Management



- Woodland (2.0 ha) — mixed oak woodland.
- Cultivated land (1.0 ha) — vegetables on terraces; aromatic herbs on the slopes.
- Orchard (0.6 ha) — mixed fruit trees, including a traditional olive grove.
- Logistics (0.4 ha) — internal road, work areas, water tanks and utility lines.

The oak woodland forms a protective and biodiverse backbone: it shelters understory species and wildlife while buffering fields from weather and erosion, reinforced by rows of olive and bay laurel along the eastern and western edges. Within the north-west woods, a fenced area hosts a small pig paddock that doubles as a winter windbreak. The upper property holds several beehives for crop pollination, and a lower runoff pond with geese and ducks provides natural weed and insect control alongside organic fertilisation. The cultivated areas lie on terraces interspersed with aromatic plants that stabilise the soil and serve as biodiversity corridors.

Challenges & Solutions

Challenge	Solution
Health & labour continuity	Flexible scheduling; mechanised heavy tasks; 'work-for-produce' network to cover peaks.
Steep tuff slope & erosion	Contour terraces; internal basalt road with drainage; aromatic strips on scarps to stabilise soil.
Water reliability	Artesian well → hill-top 10,000-L tank → gravity-fed ring main and drip lines; routine flushing & filter maintenance.
Pests & diseases	Rotations, intercropping, zero synthetic inputs; habitat for beneficials via hedgerows, pond, woodland edges.
Wild-boar damage	~1,000 m perimeter fence (2 m high) with buried welded mesh on T-posts; monitor pressure points.
Wind exposure	North-west woodland used as a windbreak; crop layout aligned to shelter lines.
Knowledge gap	Ongoing self-study; field trials in permaculture, biodynamic and synergic methods tailored to the site.
Economics & bureaucracy	Direct sales to restaurants/CSA; olive oil to trusted circle (5-L tins); grants not accessed due to red tape; transparent local pricing.
Feed & circularity	Animals fed mainly with vegetable scraps; winter supplements from local grains; manure returned to fields.

Food Production

Crops. Terraced fields host seasonal vegetables with broad varietal trials. Scarps are planted with aromatic strips that stabilise soil and serve as biodiversity corridors. The orchard mixes ancient, locally adapted fruit species; the olive grove includes seven oil cultivars

Livestock & pollinators. Chickens, turkeys, geese and duck supports on-farm provisioning; Cinta Senese pigs are for the founder’s household; Around 10 beehives ensure pollination and honey. Animals are fed mainly with vegetable scraps, with small winter supplements.

Water & soil management. An artesian well supplies a hill-top tank feeding a gravity ring and drip lines. Minimal tillage, organic manures, straw mulching, and rotations/intercropping sustain mycorrhizae and soil bacteria, improving structure, moisture retention, and long-term fertility.

Supply & use. Fresh produce is sold directly to trusted local clients and via a work-for-produce network. Olive oil is cold-processed at a regional mill and sold only in 5-L tins to a trusted circle. Aromatic herbs are delivered fresh and gifted with orders.

Stakeholders

Emile Ammann

Seeds of Tradition: The San Marzano Story

AUTHOR
Judith Chileshe
j.chileshe@ studenti.unina.it

AFFILIATIONS
University Of Naples Federico II

BACKGROUND

Southern Italy is a secondary center of tomato diversity and home to valuable crop landraces[2]. The San Marzano, renowed for its flavour and economic value, is cultivated in the **Agro Sarnese-Nocerino region** of Campania and holds Protected Designation of Origin (PDO) status (San Marzano 2 & Kiros) [2]. Since the 2000s, modern hybrids have caused a **decline in landrace cultivation due to high production costs and reduced competitiveness**[1 3]. This study examines how certifications and smallholder farming practices in Salerno support the conservation of traditional San Marzano varieties.

Source: sanmarzanotomatoes.com

OBJECTIVES

- Assess **the role of certifications** in protecting authenticity, viability, and promoting consumer trust.
- Examine **smallholder farmers' role and challenges in** safeguarding agrobiodiversity..

Source:Unsplash

AGROBIODIVERSITY ASPECTS

- Conserving and growing traditional tomato varieties threatened by loss from conventional farming.[2]
- Alternative/local supply chains like farmers' markets, cooperatives, or gourmet product lines.[3]
- Uses traditional, low-input methods like organic farming and manual harvesting, unlike industrial monocultures. [5]
- Local farmers, researchers, consumers, and policymakers may all be engaged in protecting and promoting these tomato varieties.

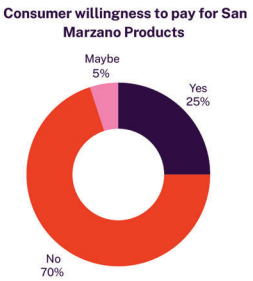
RESULTS

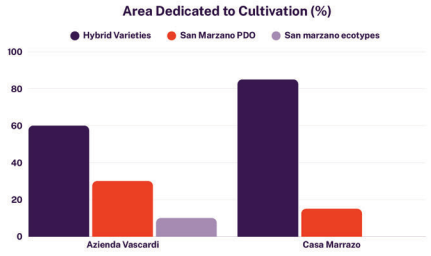
1. **Farmers' Contribution**
   - Cultivate for tradition & identity; save seeds with care.
   - Knowledge passed down through generations.

Challenges:
   - Genetic erosion & reduced disease resistance.
   - Yields up to 90% lower than hybrids.
   - Counterfeit products & limited markets.
   - Climate change increases pests & diseases.

2. **Consumer Awareness**
   - Many can't tell genuine PDO from "San Marzano-style."
   - High prices + low awareness = weak market support for biodiversity crops.

3. Certification Insights
   - PDO: Protects quality & value, but some farmers opt out
   - Organic & Slow Food Presidia: Promote cultivation of ecotypes





CONCLUSION

San Marzano tomatoes, prized for their flavour and heritage, face threats from genetic erosion and regulatory challenges. Expanding certification and conservation initiatives, such as ARCA 2010, to other varieties is key. Efforts should be multidisciplinary, valuing farmers as knowledge custodians, and supported by coherent policies that promote agrobiodiversity. Consumer education is vital to support informed choices and sustain the premium market for authentic San Marzano tomatoes.

RELATED LITERATURE

1. Casa Marrazzo & Azienda Agricola Viscardi Michele. (2025, June). Personal interviews.
2. Sacco, A., Cammareri, M., Vitiello, A., Palombieri, S., Riccardi, R., Spigno, P., & Grandillo, S. (2017, May 17). Italian traditional tomato varieties: A focus on the Campania region. In I Congrés de la Tomaca Valenciana: La Tomaca Valenciana d'El Perelló (pp.179–193). Universitat Politècnica de València. https://doi.org/10.4995/TOMAVAL2017.2017.6526
3. Caramante, M., Rouphael, Y., & Corrado, G. (2021). The Genetic Diversity and Structure of Tomato Landraces from the Campania Region (Southern Italy) Uncovers a Distinct Population Identity. Agronomy, 11(3), 564. https://doi.org/10.3390/agronomy11030564
4. Gorgitano, Maria Teresa & Lombardi, P. & Verneau, Fabio & Caracciolo, Francesco. (2012). Supply chain and sustainability: The case of San Marzano PDO tomato. Economia Agro-Alimentare. 14. 55-84.
5. Corrado, G., Caramante, M., Piffanelli, P., & Rao, R. (2014). Genetic diversity in Italian tomato landraces: Implications for the development of a core collection. Scientia Horticulturae, 168, 138–144. https://doi.org/10.1016/j.scienta.2014.01.027

Benefit sharing mechanisms in the Regional Natural Park (RNP) Anaime-Chili, Colombia

Laura Victoria Calderon Acero, Junior Researcher

18.08.2025

Introduction

Since 2017, the Anaime-Chili Regional Natural Park has been established within the jurisdiction of four high-mountain municipalities (Cajamarca, Roncesvalles, Ibagué, and Rovira) in the department of Tolima, southern Colombia. The environmental significance of this area lies primarily in its provision of water regulation services to the populations within the Coello and Cucuana river basins for irrigation, domestic use, aquaculture, and energy generation. In collaboration with various territorial stakeholders, the civil society organization Semillas de Agua designed and negotiated **permanent, incremental, and verifiable compensation mechanisms (ECOVIP).** These agreements stipulate that a portion of the funds collected from water users is allocated to the high-mountain inhabitants as compensation for their conservation efforts.

Research question: What strategies do local actors propose to adapt nationally promoted economic conservation instruments to their specific territorial contexts?

Anaime-Chili RNP

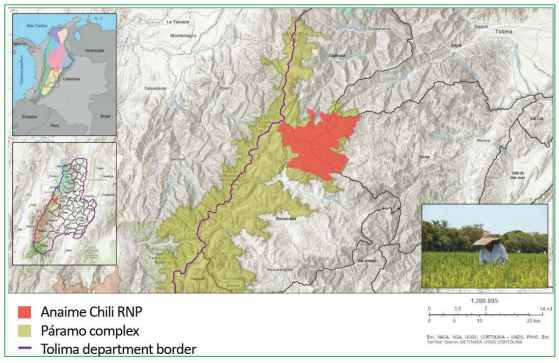


Figure 1. *Location of Anaime-Chili Regional Natural Park (RNP)*

Key policy instruments relevant to the case study:

- Decree 1900, 2006: 1% of downstream project investments mandated for water source conservation
- Law 1930, 2018: *Páramos* are recognized as strategic ecosystems for the country
- Decree 870, 2017: PES schemes and other incentives for conservation in Colombia

Aspects of agrobiodiversity

Diversity of Agricultural Land:

- ✓ Unique biophysical conditions and a crucial role in providing water regulation services for downstream agricultural activities and energy generation.

Diversity of Agricultural Management Practices:

- ✓ Traditionally used for livestock and crop production, including extensive cultivation of potatoes, onions, and peas.

Diversity of Stakeholders: A pluralistic governance structure and legal framework that reflects the diverse values, interests, and knowledge systems.

Compensation mechanisms and stakeholder roles in conservation

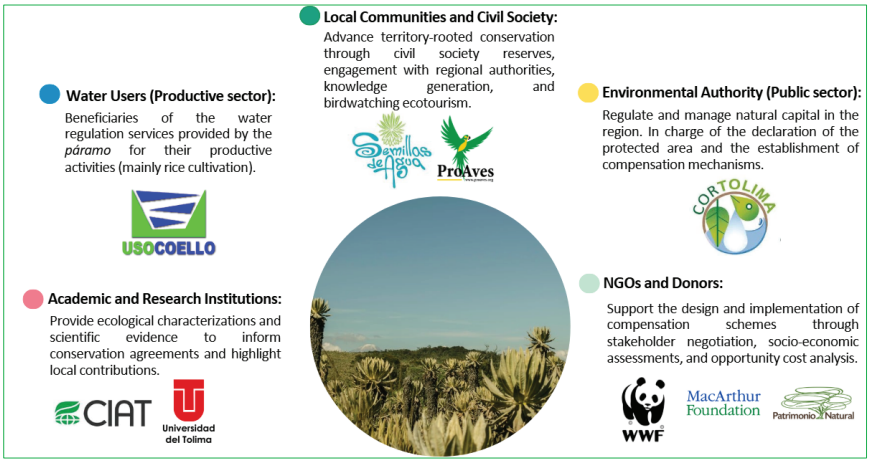


Figure 2. *Stakeholders involved in the case, grouped by actor category*

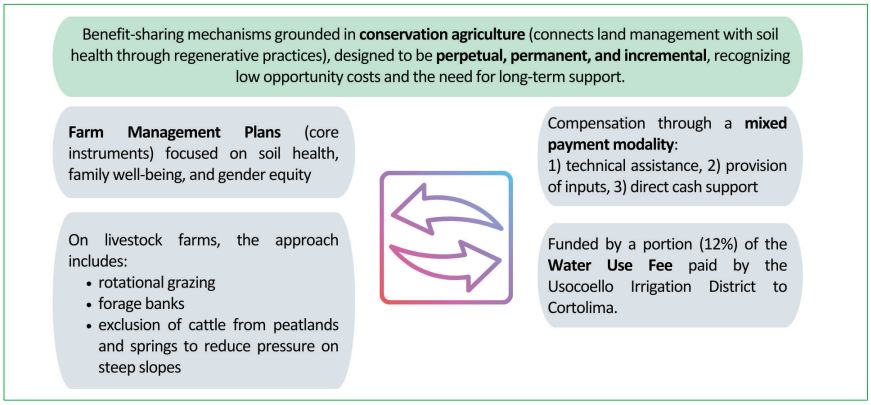


Figure 3. *Key characteristics of the benefit-sharing mechanisms in the RNP*

Further questions

1. How do land-use legacies influence who participates, who benefits, and which conservation outcomes are prioritized in protected areas?
2. How can the conservation of agrobiodiversity and local food traditions be integrated into biodiversity conservation efforts within protected areas?
3. There is a need to consider the role of buffer zone communities—where land-use conflicts are most pronounced—in agrobiodiversity conservation.

References

- Whatsapp interviews with Jorge Rubiano, legal representative of Semillas de Agua corporation. 14.02.2025 and 12.07.2025
- Tolima Regional Autonomous Corporation- Cortolima. (2019). *Technical Document Supporting the Incentive for the Provision of Verifiable, Permanent Incremental Hydrological Services in the Anamá and Chili Regional Natural Park*.
- Tolima Regional Autonomous Corporation- Cortolima. (2019). *Socio-environmental management plan of the Anaime and Chili Regional Natural Park.*
- *Fula López, M. A. (2023, June 23). Perceptions of environmental justice in the implementation of a Payment for Environmental Services scheme in the corregimiento of Juntas (Combeima River Canyon, Tolima).* Bachelor's thesis, Pontificia Universidad Javeriana.

Contact details:
Email: lvcalderona@uni-bonn.de
Mobile number: +49 1573 6182355

Organised and supported by:

Does Crop Diversity Improve Food Sufficiency? Insights from the Tharu Community in Nepal

Madhavi Parajuli[1,3*], Krishna Kumar Pant[2], Rabindra Adhikari[1,4], Thomas Scholten[1] and Steffen Seitz[1]

[1]University of Tübingen, Department of Geosciences, Chair of Soil Science and Geomorphology, Rümelinstrasse 19-23, 72070 Tübingen, Germany
[2]Central Department of Botany, Tribhuvan University, Nepal
[3]Department of Watershed Management and Environmental Science, Institute of Forestry, Hetauda Campus, Tribhuvan University, Nepal
[4]Department of Watershed Management and Environmental Science, Institute of Forestry, Pokhara Campus, Tribhuvan University, Nepal

Introduction

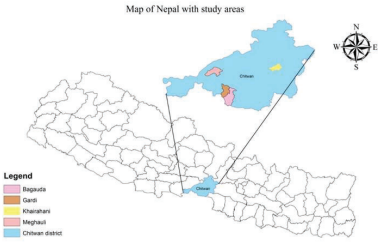
- Tharus are the oldest and the largest ethnic group (total population of 6.75%) (CBS, 2001) among more than other hundred ethnic and caste groups indigenous to Terai region of Nepal (CBS, 2003).
- Before 1950, the Tharus were the only inhabitants of Terai who had high resistance to malaria, despite it being a malaria-prone area (Gurung, 1983; Gee, 1959).
- In addition to agriculture, fishing and fresh water snail collection were essential components of the Tharu diet, providing a vital source of protein (Muller-Böker, 1993).
- The diversity in crop production contributes to people livelihood directly through food production and indirectly through supporting and protecting human activities (Cromwell, 1999).
- Agricultural diversity contributes to the secured livelihood through food security and also fulfills the social, cultural and religious needs of farmers. So, the single crop production as staple crop is less food secure (Wahlqvist, 2003).

Research Question
How does crop diversification strengthen food sufficiency?

Methods

4 VDCs in Chitwan: Khairahani, Gardi, Meghauli and Baghauda

- 160 households, survey, face-to face interviews, key informant interviews, focus group discussions (FGDs), field observations



Figures: Map with study areas (above), FGDs (down left) and field crops (down right)

Challenges and Benefits of Agrobiodiversity

Challenges

- Small and fragmented landholdings
- Inadequate/ no irrigation
- Limited access to agricultural inputs and technology
- Market constraints and post-harvest losses
- Rice diverted to alcohol
- Low awareness

Benefits

- Increased crop diversification
- Preservation of indigenous farming practices and knowledge
- Awareness on food security
- Resilience of local cultivars to climate change

Conclusion

1. High crop diversification
2. Positive correlation between crop diversity and food sufficiency
3. Hunger satisfaction was above 50% when consumed rice thrice a day except in Meghauli (44%).
4. Khairahani VDC showed highest food consumption and hunger satisfaction.
5. Low awareness on food security, highest in Khairahani (58%).

Results

1. Agrobiodiversity aspects

Rice varieties as *Anadi, Mansuli, Sama, Sona, War, Sukha dhan, Sabitri, Gorakhnath*

Vegetables: tomato, potato, cabbage, faba beans, broccoli, bottle gourd, sponge gourd, bitter gourd, okra, radish, cauliflower, snake gourd, pumpkin, egg plant, spinach, etc.
Fruits: sugarcane, banana, papaya, guava, mango, jackfruit, etc.
Oil seeds: mustard (*Brassica spp.*), linseed, sesame, etc.
Legumes: lentil, chick pea, pigeon pea, black gram, cowpea, soyabean, green gram, horse gram, etc.
Spices: turmeric, ginger, onion, garlic, chili, coriander, mustard seed, cumin, Indian bay, lemons, lime, etc.

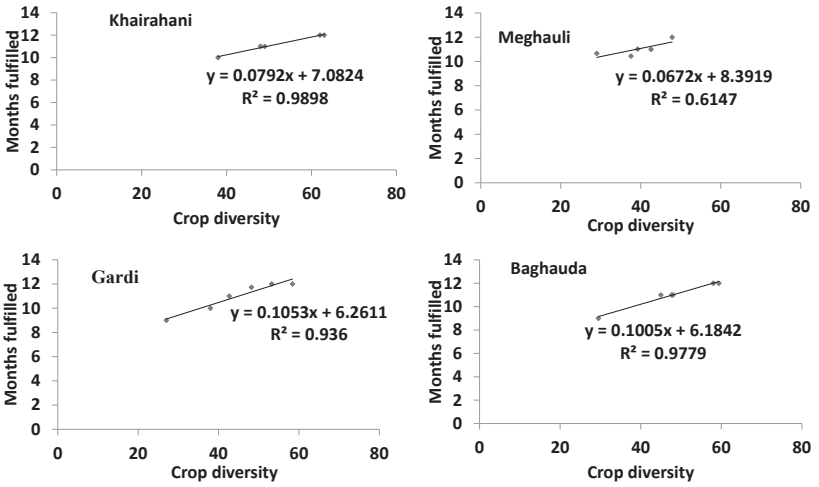
Lowlands and uplands; crop lands to grow cereals, oil seeds, legumes, vegetables and spices; some orchards for fruits; fallow land; monoculture as well as polyculture practiced; people depended on monsoonal rainfall but some land had good access to irrigation facility; kitchen garden

Mostly, land tilled by tractors and sometimes manually. Rice hybrid varieties needed more chemical fertilizers. Crop management practices like monoculture, polyculture, intercropping and agroforestry practiced. Few commercial agriculture.

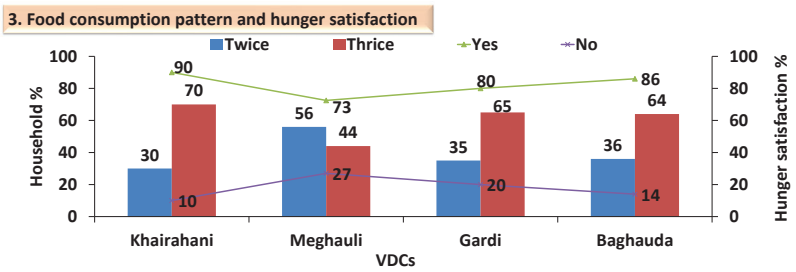
Subsistence type of farming and few commercial farms; Remote areas-barter systems; surplus foods and products were stored at own houses and in case of more surplus, directly sold in nearby local market

No wide range of individuals, groups or organizations involved in the system; some variation in the involvement of people from other ethnic groups; tourism was very famous and this also had influence in the diversity of stakeholders.

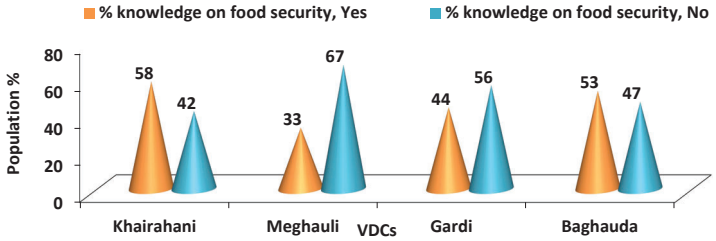
2. Correlation between crop diversity and months of food sufficiency



3. Food consumption pattern and hunger satisfaction



4. Awareness on food security



References

CBS. (2003). Statistical year book of Nepal. Central Bureau of statistics, National Planning Commission, Kathmandu, Nepal.
Cromwell, E. (1999). Agriculture, Biodiversity and Livelihoods: Issues and entry points. Final Report. Overseas Development Institute, London.
Gee, E.P. (1959). Report on a survey of the rhinoceros area of Nepal. Oryx 5(1):59-85.
Gurung, K.K. (1983). Heart of the Jungle, The Wildlife of Chitwan, Nepal. Andre Deutsch Limited. 105 Great Russell Street London WC1 in association with Tiger Tops Pvt. Lt. Kathmandu, Nepal.
MoAD. (2014). Statistical information on Nepalese agriculture. Government of Nepal, Ministry of Agricultural Development, Agri Business Promotion and Statistics Division. Agri-statistics Section, Singha Durbar, Kathmandu: Nepal
Muller-Bokker, U. (1999). The Chitwan Tharus in Southern Nepal- An Ethnological Approach, Franz Steiner Verlag Stuttgart: Germany.
Wahlqvist, M.L. (2003). Regional food diversity and human health. Asia Pacific Journal of Clinical Nutrition, 12(3): 304-308..

Contact: madhavi.parajuli@uni-tuebingen.de

Summer School Agrobiodiversity

ORTI GENERALI
Agroecology at different scales

INTRODUCTION
Orti Generali is a urban agriculture project in **Turin**'s South Mirafiori suburb. Evolving from a 4 year-long participatory project launched in 2010, it transformed a former industrial site into a 13-hectare urban garden park with **270 organic plots** and educational spaces. Promoting agrobiodiversity, social inclusion, and sustainability, it gathers urban gardeners, schools, researchers, and vulnerable groups. As a hub for learning and innovation about sustainability issues, it collaborates with the University of Turin for ongoing learning and knowledge exchange. This case study focuses on one key challenge identified within the project: increasing the availability of locally sourced seedlings for the garden plots, a priority for further enhance agrobiodiversity and strengthening the project's ecological impact.

CASE STUDY OBJECTIVE
Illustrating the best practices already adopted by the enterprise and delving deeper into possible strategies to further increase the agrobiodiversity, focusing on the availability of local seeds and seedlings for the garden plots.

Fig 1 a.Scottish highlander, b. pollinators attracted by flowering vegetables

AGROBIODIVERSITY ASPECTS

Biodiversity of agricultural land
- Reduced mowing in shared green areas
- Transformation of former irrigation canals into grassed ecological corridors to support insect movement and habitat restoration
- Planting of 300 trees throughout the site and its surroundings, including tree-lined avenues, bushy hedgerows around the vegetable plots, and fruit trees of ancient and locally adapted varieties integrated within the gardens themselves.
- Scottish Highlanders grazing in a green area to test a possible alternative management strategy of urban green.

Diversity of agricultural management practices
- Gardeners choose how to manage their plot, following a set of guidelines agreed upon at the time of signing the contract. These include adopting organic practices, avoiding plastic materials (with some exceptions), and maintaining their plots.
- Of the 270 assigned garden plots, 100 follow an agroforestry design, with locally adapted fruit tree varieties planted by the staff before the start of the renting agreement.

Diversity of stakeholders
- Community of urban gardeners
- Local governments and civic organizations
- University and researchers
- Local schools and families
- Staff → composed of members hired directly by the company, as well as others who join the project to complete their probation period, fulfill civil service, conduct thesis work, or undertake internships aimed at supporting workforce integration.

Species diversity within crop and livestock
- Gardeners cultivate the crops of their choice within their individual plots, which range in size from 50 to 100 square meters. This autonomy naturally encourages a high level of crop species diversity across the site.
- Organization of horticulture and permaculture trainings in collaboration with field experts, to spread awareness on sustainable practices that also foster agrobiodiversity.

Genetic diversity of crop and livestock
- Gardeners choose where to source their seeds and seedlings for cultivation on their individual plots. As a result, a natural level of crop genetic diversity is consistently maintained.
- While livestock farming is not practiced at Orti Generali, a small number of farm animals are present on site, including chickens of the traditional local breed Bionda Piemontese (Blonde from Piedmont).

Fig 2 Educational activity lead by a volunteer of Orti Generali

RESULTS
To boost local seed and seedling availability

CHALLENGES
- Identification and supply of local seed varieties
- Progress mesurament, from setting an initial benchmark to tracking development

POSSIBLE STRATEGIES
- Setting up an informal seed exchange network among urban gardeners
  a. Initial survey to the farmers to identify one or two locally adapted varieties of main interest to test the approach
     - using the communication media already established: whatsapp channel, instagram page of the enterprise, oral communication
- Identify volounteering urban gardeners and setting up training session(s) to train them in proper seed handling, management and selection as well as on the value of such practices and the role of informal seed system to conserve agrobiodiversity.
- Measure the initial variation of varieties of the selected species in their fields and use it as a benchmark
- Organize seed fairs to exchange the farmer selected material

CONCLUSIONS
While Orti Generali addresses many aspects of agrobiodiversity, increasing the availability of locally adapted annual varieties remains an opportunity for growth. Given challenges in seed and seedling supply through formal channels, and the enterprise's strong focus on social engagement, establishing an informal seed system could be an effective strategy to enhance variety across the plots.

AUTHOR:
Michela Daraio
AFFILIATION:
Wageningen University and Research
CONTACT:
michela.daraio@wur.nl

REFERENCES:

ttps://interlace-hub.com/sites/default/files/uploads/Conexus_T5_3_factsheet_turin_v3.pdf
https://www.ortigenerali.it/en/the-project/

Agrobiodiversity in Punjab's Traditional Farming Systems:

A Case Study of Muhammad Naeem´s Agriculture Farm, Faisalabad, Pakistan

Muhammad Hamad Ahmer

Global Change Ecology, Universität Bayreuth

INTRODUCTION

- In Pakistan's Punjab province, agricultural intensification has led to a decline in traditional crop and livestock diversity.
- This case study focuses on Muhammad Naeem, a mid-scale farmer from Faisalabad, who integrates indigenous crop varieties with livestock farming to sustain productivity, biodiversity, and livelihoods.
- Agricultural monocropping and the preference for high-yield commercial varieties have reduced on-farm genetic diversity.
- Muhammad Naeem's case addresses the need to preserve traditional crop and livestock varieties while maintaining farm profitability and resilience under changing climatic conditions.

Value Chains / Products

Wheat (Khushhal, NARC-2011) – Sold for flour production; surplus stored for household use and seed saving.

Traditional Basmati rice – Marketed locally and for export, attracting premium prices

Sugarcane – Supplied to regional sugar mills.

Maize – Sold to feed processors and used on-farm.

Fodder crops – Fed to livestock, reducing purchased feed costs.

Milk from Sahiwal cattle – Sold fresh and through cooperatives for processing.

AGROBIODIVERSITY ASPECTS

Species diversity within crops and livestock

Genetic diversity of crops and livestock

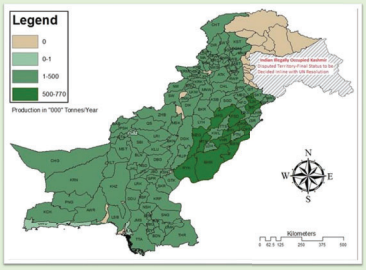


Fig. 1. District-wise wheat production across Pakistan (data source: PBS, 2011).

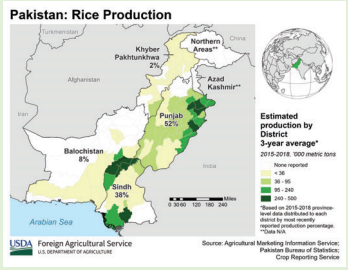


Fig. 2. Rice production in Pakistan (USDA)

RESULTS & CONCLUSIONS

- **Local adaptation** – Indigenous crops and livestock thrive under Faisalabad's climatic conditions.
- **Climate resilience** – Crop-livestock integration reduces vulnerability to weather extremes.
- **Ecological sustainability** – Crop rotations with legumes improve soil fertility and reduce chemical use.
- **Social sustainability** – Strengthens farmer networks and knowledge sharing.
- **Economic sustainability** – Multiple revenue streams stabilize income and reduce market dependency.

Muhammad Naeem's farming system demonstrates that maintaining agrobiodiversity through traditional crops and livestock, supported by modern market linkages, can enhance resilience, profitability, and sustainability. Scaling such models can contribute to food security, climate adaptation, and conservation of genetic resources in Punjab and beyond.

CHALLENGES

- Loss of indigenous varieties due to hybrid seed dominance.
- Climate change-related droughts and floods reducing yields.
- Rising costs of inputs (fertilizers, seeds, feed).
- Limited market access for niche and heritage products.
- Livestock health issues from inadequate veterinary services.

References

1. FAO. (2019). *The State of the World's Biodiversity for Food and Agriculture*. Rome: FAO.
2. Jarvis, D. I., et al. (2011). *An heuristic framework for identifying multiple ways of supporting the conservation and use of traditional crop varieties*. Critical Reviews in Plant Sciences, 30(1-2), 125-176.
3. Iqbal, M., Afzal, M., & Ahmad, M. (2001). *Livestock diversity in Pakistan: present status and future challenges*. Pakistan Veterinary Journal, 21(4), 203-210.
4. Smale, M. (2006). *Valuing crop biodiversity: On-farm genetic resources and economic change*. CABI Publishing.
5. Sarfaraz, S., Shoukat, S. S., & Khan, T. M. A. (2021). Investigating wheat yield and climate parameters regression model based on Akaike information criteria. *Pak. J. Bot*, *53*(4), 1299-1306.

Muhammad Hamad Ahmer
Universität Bayreuth, Germany

Agrobiodiversity Summer School 2025

Monday, 18 August 2025

ZHAW - ZÜRICH UNIVERSITY OF APPLIED SCIENCES:
AGROBIODIVERSITY SUMMER SCHOOL 2025

NINA HUBER
HUBERN02@STUDENTS.ZHAW.CH

PURA VERDURA

AGROBIODIVERSITY IN A ZURICH-BASED CSA

Industrial food systems have contributed to biodiversity loss, food waste, and a growing disconnect between consumers and producers. This mini case study explores Pura Verdura, a community-supported agriculture (CSA) cooperative in Zurich that offers an alternative through local food production, shared responsibility, and biodiversity-focused farming.
This case study explores how a CSA model like Pura Verdura can support agrobiodiversity through local, sustainable, and participatory food production and what are Benefits and challenges of these initiatives.

ABOUT PURA VERDURA

- **FOUNDED** in 2019
- **COMMUNITY-SUPPORTED AGRICULTURE**
- **GOAL**: providing fresh, local vegetables while promoting biodiversity and reducing food waste
- **TEAM**: experienced gardeners, cooperative members and volunteers
- **CSA SUBSCRIPTION** MODEL: Members pay a fixed seasonal fee and get weekly bags of organic vegetables
- **PRODUCTION**: diverse vegetables from an annual planting plan
- **ORGANIC** FARMING: Regenerative practices such as crop rotation, companion planting, no-till farming to promote soil health
- **BIODIVERSITY** MEASURES: Habitat zones for different species
- FOOD WASTE PREVENTION: harvest-sharing events and redistribution of surplus vegetables

AGROBIODIVERSITY ASPECTS

SPECIES DIVERSITY
Tomatoes, Swiss chard, Tulsi, Kohlrabi, etc.

BIODIVERSITY OF AGRICULTURAL LAND
habitats for wild bees, butterflies, lizards

DIVERSITY OF MANAGEMENT PRACTICES
crop rotation, no-till farming, companion planting

DIVERSITY OF STAKEHOLDERS
members, gardeners, Grünstadt Zürich, Natur im Siedlungsraum

BENEFITS

ECOLOGICAL SUSTAINABILITY & BIODIVERSITY
Organic methods, crop rotation and habitat zones improve soil health, support pollinators and enhance biodiversity (Egli et al., 2023).

SOCIAL INCLUSION & PARTICIPATION
Members take part in farm work and decisions, strengthening community ties and transparency.

FOOD WASTE REDUCTION
Surplus vegetables are shared or preserved, promoting food waste (Milford et al., 2025).

FOOD SYSTEM RESILIENCE
lLocal, seasonal production and shared risks reduce dependence on global markets.

MENTAL HEALTH & WELL-BEING
Participation supports emotional health, outdoor activity and social connection (Milford et al., 2025).

DIETARY DIVERSITY
Members discover and eat more varied seasonal vegetables (Milford et al., 2025).

SUSTAINABILITY TRANSITION
The CSA model encourages values of care, ecology and cooperation (Galley et al., 2025)

CHALLENGES

CLIMATE IMPACTS
Yields vary due to drought, rain or heat.

LABOR & FINANCIAL DEMANDS
Work hours and fees can be a barrier and stress members.

RETENTION & UNPREDICTABILITY
Physical work, prepayment and unfamiliar crops may limit participation (Milford et al., 2025).

EQUITY & ACCESS
Income, time and background affect who can join (Galley et al., 2025; Egli et al., 2023).

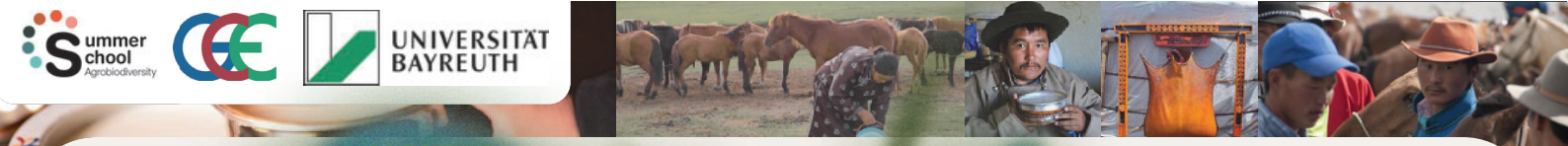
SCALING LIMITS
CSA initiatives often stay small and local Galley et al., 2025).

CONCLUSION

Pura Verdura demonstrates how CSA models can foster agrobiodiversity through ecological practices, shared responsibility, and seasonal crop diversity. The initiative not only supports biodiversity and reduces food waste but also strengthens community ties and food system resilience. At the same time, challenges like limited accessibility, climate-related risks, and dependency on active participation reveal the limits and potential of CSA models in driving wider food system change.

REFERENCES

- Pura Verdura. (n.d.). Website of the Pura Verdura cooperative. Retrieved July 7, 2025, from https://www.puraverdura.ch
- Egli, M., Hartmann, C., & Bottazzi, P. (2023). A systematic review of ecological, social, and economic outcomes of Community Supported Agriculture (CSA). Frontiers in Sustainable Food Systems, 7, 1136866. https://doi.org/10.3389/fsufs.2023.1136866
- Galley, S., Saleh, R., & Bottazzi, P. (2025). Do solidarity-based food systems contribute to just sustainability transitions? A case study of community-supported agriculture in Western Switzerland. Climate Risk Management, 42, 100263. https://doi.org/10.1016/j.clrc.2025.100263
- Milford, A. B., Vittersø, G., & Eide, H. M. (2025). Community Supported Agriculture's perceived positive impacts on life quality and health: A comparative study in Britain and Norway. Agricultural and Food Economics, 13(1), 6. https://doi.org/10.1186/s40100-024-00343-5



Preserving Agrobiodiversity:
The Case of Mongolian Airag and Nomadic Herding

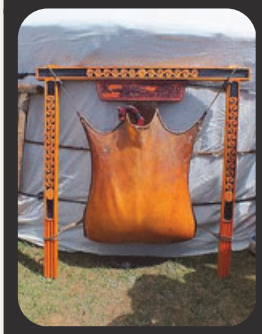
Topic/Aim

This mini case study aims to describe the traditional system and its intricate connections to agrobiodiversity in Mongolia. **Airag** is a traditional fermented mare's milk beverage, deeply rooted in Mongolia's cultural heritage and nomadic pastoralism, particularly in the vast grasslands and forest-steppe regions. This ancient practice is a unique example of how human activities, livestock, and the natural environment interact to create a sustainable food system.

Agrobiodiversity aspects

- Genetic diversity of crops and livestock
- Species diversity within crops and livestock
- Biodiversity of agricultural land
- Diversity of stakeholders

How it's made



Airag production is a labor-intensive, seasonal process integral to nomadic life. It involves the daily milking of mares and continuous churning of the milk in a traditional **khokhuur** (a cowhide vessel) using specific wooden tools to facilitate fermentation. This traditional method, sustained over millennia, relies on natural microbial action and unique management practices.

Challenges

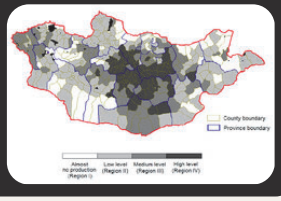
- **Environmental Pressures:** Climate change, with droughts and harsh winters (dzud), severely impacts pasture and water, affecting horse health and milk yield.
- **Land Use Changes:** Urbanization, mining, and degradation lead to shrinking grazing lands and resource scarcity.
- **Socio-economic Shifts:** Labor shortages arise as younger generations migrate to urban centers, threatening traditional skill transfer.
- **Disease Outbreaks:** Animal diseases can devastate horse herds, jeopardizing milk supply and airag production.
- **Limited Market Access:** While primarily for family consumption, limited market development hinders economic incentives for producers.

Results

Airag production varies across four main regions in Mongolia, with different levels of production. The average horse density, percentage of mares in a total horse herd, number of milkings a day, and airag season differ significantly among these regions.

Airag producing level	Horse density (head/km²) Average	Mare (%)	Number of milking (times)	Airag season Start	Airag season End
Almost no production (Region I)	1.5[a]	10.7[a]	6–7	late June	late Aug
Low level (Region II)	2.1[b]	27.0[b]	6–7	late June	early Sep
Medium level (Region III)	2.3[c]	31.9[c]	6–7	late June	mid-Sep
High level (Region IV)	3.6[d]	36.8[c]	6–7	late June	early Oct

Table 1. Average horse density, percentage of mares in a total horse-herd, number of milkings a day, and seasons for airag production for the different airag-producing regions (I–IV). Different letters (a, b, c) refer to a significant difference ($p < 0.05$) between the characteristics



Conclusions

Herders recognize these challenges and highlight the need for:

- Stronger support for traditional knowledge preservation.
- Market development initiatives for reliable income streams.
- Climate resilience strategies for pastures and livestock.
- Addressing labor shortages through community support or policy incentives.

References

- Bat-Oyun, Tserenpurev & Erdenetsetseg, Baasandai & Shinoda, Masato & Ozaki, Takahiro & Morinaga, Yuki. (2015). "Who is Making Airag (Fermented Mare's Milk)?". A Nationwide Survey of Traditional Food in Mongolia. Nomadic Peoples. 19. 7-29(23). 10.3197/np.2015.190103.
- Hyun, Jiye, Baatarstogt Oyungerel, and Hong Sik Kong. "Genetic diversity and population structure of Mongolian regional horses with 14 microsatellite markers." *Animal Bioscience*, 2022.
- Ganzorig, O., Batdorj, B., & Satomi, I. (2025). Characterization of volatile compound profile in Mongolian traditional fermented mare's milk, as Airag. Animal Science Journal, 96(1), e70024. https://doi.org/10.1111/asj.70024

Author: Khulan Gansukh, M.Sc in Global Change Ecology,Email: 3khulan3@gmail.com

Hof Narr: Everything can be different

– with hand, heart and mind for the future

Author: Sarah Gonzenbach, gonzesar@students.zhaw.ch

Affiliations: ZHAW, MSc Environment and Natural Ressources - Agroecology and Food Systems

Introduction and Purpose

Industrial (livestock) farming raises major ethical and environmental concerns. In response, the agricultural association "Hof Narr" was founded, promoting animal respect, agrobiodiversity and sustainable food systems.

This case study explores how Hof Narr contributes to agrobiodiversity through its practices, species choices, and stakeholder engagement. Their value chain, as well as its challenges and opportunities are analysed, answering the following research question:

"How does Hof Narr support agrobiodiversity, and what are its social, ecological and economic benefits?"

Agrobiodiviersity aspcets

Genetic diversity: preserving rare and endangered breeds with less-used genetic lines by rescuing them from standardized livestock production

Species diversity: hosting a wide range of animal species and cultivating various vegetable and fruit species and varieties to meet full household needs

Biodiversity of agricultural land: creatig habitats e.g. through flower meadows and high-stem trees while also promoting soil health e.g. through minimal tillage

Diversity of agricultural managemnet practices: biovegan, low-intensity, manual cultivation inspired by permaculture, aiming to close nutrient cycles

Diversity of production & food supply systems: distribution through subscriptions, a farm shop and gastronomy - short & transparent food chain

Diversity of stakeholders: involving diverse actors - from consumers to schools, companies and farmers - through workshops, tours and education

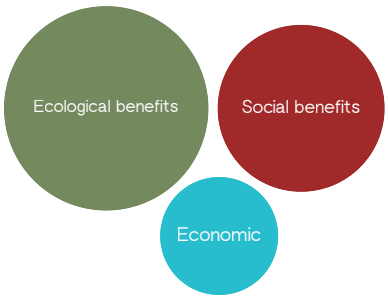


Figure 1: Benefits regarding local adaptation, resilience & sustainability

Biodiversity & soil health, long-term ecological balance & adaption

Diversification of income and promotion of economically beneficial plant-based farms

General ethical education & support of farmers transitioning, empowering systemic change

Results

Active promotion of agrobiodiversity through:

- ethical principles
- agricultural and ecological practices
- stakeholder engagement

The raise awareness, promote knowledge & social responsibility, influencing various stakeholders:

- Consumers
- Participants (events/education)
- TransFARMation network
- Donors and volunteers

Conclusion

Hof Narr actively supports agrobiodiversity through the integration of rescued animals, diverse crops, ecological land use and educational outreach. Their biovegan, extensive appraoch demonstrates how ethical values and biodiversity can lead to resilient and sustainable food systems. They are a role model inspiring various stakeholders for alternative farming practices, supporting a broader transition towards plant-based, biodiversity-conscious agriculture.

References

Hof Narr, V. (2022). Tätigkeitsbericht. Hof Narr. https://www.hof-narr.ch/taetigkeitsbericht; Verein Hof Narr. (2025). Hof Narr. https://www.hof-narr.ch/
Bundesamt für Landwirtschaft. (2025). Biodiversitätsbeiträge. https://www.blw.admin.ch/de/biodiversitaetsbeitraege
IFAD, Investing in rural people. (2024). The three types of biodiversity: explained. https://www.ifad.org/

Wild Pastures

Integrating Nature Conservation and Sustainable Meat Production

Svenja Steckel – Agrobiodiversity Summer School 17.08.2025 – 27.08.2025

Introduction, Topic, and Purpose

The "Wild Pastures" in Schleswig-Holstein, Germany, integrate nature conservation with sustainable meat production was established in year 2000. Robust cattle, sheep and goat breeds graze extensively on 2,500 hectares of protected land, preserving habitats like semi-open grassland and wetlands while enhancing biodiversity. This low-impact grazing supports regional, high-quality meat production. By integrating diverse stakeholders, the project promotes agrobiodiversity, sustainable food systems and environmental education [1,2].

How can semi-open pasture landscapes with robust grazing breeds contribute to the development of agroecological food systems, particularly in terms of biodiversity, resilience, and sustainable production?

The objective is to analyze the ecological and agricultural effects of wild pastures in the context of biodiversity-promoting, climate-resilient, and regionally integrated food systems.

Agrobiodiversity aspects

Biodiversity of agricultural land

Diversity of management practices

The grazing land mostly originate from previous use as conventional agriculture or are former military sites and belong now to NATURA 2000 [1,3]. Particularly on former military sites, distinct areas of nutrient-poor grassland have formed. The extensive grazing creates a semi-open landscape with a high diversity of (endangered) species and structures and preserve the nutrient-poor grassland [3,4,5].

Skillful pasture management is a prerequisite for successful grazing. The individual animal breeds have different requirements, especially with regard to the different habitat conditions (open & semi-open pasture, wetland) and therefore require different management practices in their husbandry [3].

Stakeholders

Farmers

Nature Conversation Foundations: Stiftung Naturschutz

State of Schleswig-Holstein

Residents, donors & visitors

Benefits

Healthy food
- Meat with high ecological standards [3]

Local adaptation & Resilience
- Resilient robust breeds [2,3]

Sustainability
- Nature conservation without machinery [3,6]

Education
- Visitor center, public guided tours [1,2,3]

Biodiversity
- Structured landscape & species richness [3-6]

Challenges

Animal welfare

Year-round grazing requires continuous feed and water supply, adequate weather protection, and breeds with high robustness [1,3].

Preservation of semi-open landscape

Grazing maintains semi-open pastures, but thorny shrubs like hawthorn resist browsing, requiring periodic mechanical control [1,3,6].

Conclusion

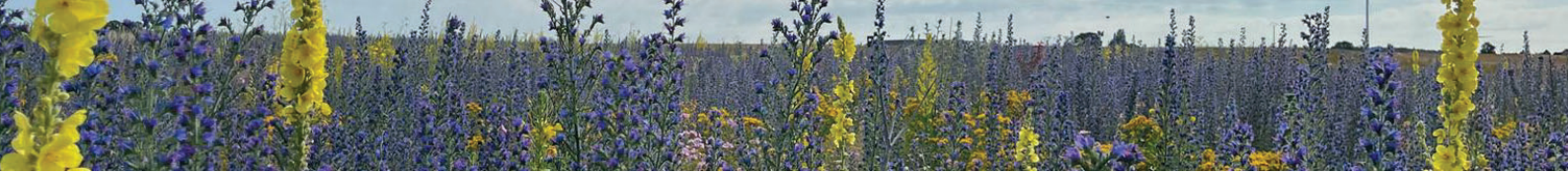
Wild pastures are a long-established conservation practice, to maintain semi-open landscapes and high biodiversity through natural grazing with robust breeds, integrating organic farming principles to foster resilience, sustainable livestock production, and high-quality regional meat.

M.Sc. Svenja Steckel
steckel@geographie.uni-kiel.de

Kiel University
Christian-Albrechts-Universität zu Kiel

Acknowledgement:
Thanks to Miriam Kimmel [1] from Stiftung Naturschutz Schleswig-Holstein for agreeing to the interview and answering my questions.

References:
[2] Stiftung Naturschutz Schleswig-Holstein. [3] Stiftung Natur im Norden. Haus der Wilden Weiden.
[4] Ruprecht, D. (2016). Effects of year-round grazing on the vegetation of nutrient-poor grass- and heathlands – Evidence from large scale survey. https://doi.org/10.1016/j.agee.2016.02.015
[5] Chabuz, W. et al. (2019). Impact of the type of use of permanent grassland areas in mountainous regions on the floristic diversity of habitats and animal welfare.
htpps://doi.org/10.1016/j.gecco.2019.e00629
[6] LLUR (2010). Beweidung von Offen- und Halboffenbiotopen.



EFFECTS OF MULCHING TIME OF FLOWER STRIPS ON INSECT BIODIVERSITY

Theis, Tabea, theis@ibla.lu

Institut fir Biologesch Landwirtschaft an Agrarökologie Luxemburg a.s.b.l. (IBLA), 1, Wantergaass, L-7664 Medernach, www.ibla.lu

Agrobiodiversity in Luxemburg

In **Luxemburg**, biodiversity is in a precarious state.[1] The main causes are **intensive farming**, the use of pesticides and fertilisers, **habitat fragmentation** and **climate change**. To counteract this, EU agricultural policy promotes measures such as **perennial flower strips**, which provide food and habitats for insects. These have been shown to **improve species diversity** and pollinator abundance. In Luxemburg in particular, such measures could make an important contribution to preserving the highly endangered insect diversity[2]. Proper management is crucial, the **timing of mulching** is a critical management decision that can strongly affect overwintering insects[3,4].

Fig. 1: Flower strip with native species.

Short description of the case

In the Our Nature Park, flowering areas were created in accordance with the Eco Schemes guidelines as part of the EU's agricultural policy to counteract the decline in insect populations in Luxembourg's agricultural landscape.

Measurements & requirements:

- Flowering areas are maintained according to eco-schemes
- 50% of the area must be renewed every two years
- the areas receive financial support

Observations:

- Mulched areas have fewer insects than not mulched areas
- Late or no mulching would be more environmentally friendly but is only possible to a limited extent due to subsidy requirements.

Effects on Agrobiodiversity

Investigation of how different maintenance measures (spring vs. autumn mulching) influence insect diversity in flower strips. Flower strips are structural elements of the agricultural landscape that provide habitat for pollinators and beneficial insects.

Comparison of different maintenance periods (management strategy) and analysis of the effects on insect biodiversity. The integration of biodiversity-promoting measures (e.g. adapted cutting times) is also a form of management-related diversity.

Involvement of farmers, researchers and political actors in the study. This interdisciplinary and participatory approach promotes agrobiodiversity in the long term, as it strengthens knowledge exchange and acceptance.

Benefits

- **Ecological resilience** through increased insect diversity
- **Sustainable pollination services**; can lead to increasing yields
- **Climate adaptation** through diversified habitats
- **Knowledge co-creation** and **farmer engagement**
- Adapted mulching as a **low-cost, high impact** ecological measure

Fig. 2: Ladybird (beneficial insect) on a flower strip

Challenges

- **Loss of insect habitats, hibernation** and **nesting sites** through autumn mulching
- **Timing conflict** between biodiversity and farm management
- Limited awareness of biodiversity benefits; underestimation of the long-term value for ecosystem services
- Lack of clear **guidelines or incentives**

Results

Practitioners highlight the **crucial role of mulching time** in maintaining the ecological value of flower strips. **Undisturbed vegetation** over the winter period provides essential habitats for insects, particularly in intensively managed landscapes with few natural refuges. From an ecological perspective, autumn mulching is often seen as problematic, as it removes overwintering sites at a critical moment in the insect life cycle.

Spring mulching, by contrast, is regarded as more beneficial for insect conservation. However, factors such as **soil conditions** and **seasonal workload** influence whether delayed mulching is feasible. According to feedback from the field, there is **no one-size-fits-all solution**. Instead, **flexible and site-specific strategies** are needed that take both biodiversity and farm management constraints into account.

References:

[1]Kasperczyk, N., Oppermann, D.R., Chalwatzis, D., 2021. Mehr Biodiversität und Umwelt-schutz mit der Landwirtschaft.

[2]Scheper, J., Holzschuh, A., Kuussaari, M., Potts, S.G., Rundlöf, M., Smith, H.G., Kleijn, D., 2013. Environmental factors driving the effectiveness of European agri-environ-mental measures in mitigating pollinator loss – a meta-analysis. Ecol. Lett. 16, 912–920. https://doi.org/10.1111/ele.12128

[3]Haaland, C., Naisbit, R. E., & Bersier, L.-F. (2011). Sown wildflower strips for insect conservation: A review: Wildflower strips for insect conservation. Insect Conservation and Diversity, 4(1), 60–80. https://doi.org/10.1111/j.1752-4598.2010.00098.x

[4]Schmied, H., Getrost, L., Diestelhorst, O., Maaßen, G., & Gerhard, L. (2022). Between perfect habitat and ecological trap: Even wildflower strips mulched annually increase pollinating insect numbers in intensively used agricultural landscapes. Journal of Insect Conservation, 26(3), 425–434. https://doi.org/10.1007/s10841-022-00383-6

HOW TO PLANT WATER WITH AGROFORESTRY

THINKING FROM THE GROUND UP

Gut UND Bösel

Gut&Bösel is a 3,000 hectare living-lab for regenerative agroecology farming in Brandenburg, Germany. Managed by Gut&Bösel GmbH and the Finck Foundation, the farm implements multifunctional land-use systems combining trees, crops and livestock to rebuild soil health, boost water retention and enhance biodiversity. Since 2019, eight agroforestry models have been established.

CHALLENGES

sandy, nutrient-poor soil and low rainfall (558 mm/ year)

Brandenburg is one of the driest regions in Germany, receiving only around 558 mm of rainfall per year on average. At the same time, the region's predominantly sandy soils can store just about 80 mm of plant-available water in the main rooting zone. This combination of low rainfall and poor water retention capacity poses a major challenge for agriculture.

Summer School Agrobiodiversity

zhaw FiBL

Case Study by Theresa Collmann
ZHAW - M.Sc. Environment and Natural Resources
Summer School 2025

FROM MONOCULTURE TO AGROBIODIVERSITY

How the farmland is being transformed into a diverse, living ecosystem - where biodiversity allows plants, animals and people to support each other, boosting productivity, resilience and adaptability to climate change.

Agroforestry Systems at Gut&Bösel integrate rows of trees and shrubs with crops and livestock in different arrangements on the same land. 8 diverse systems have been established:

- *Agrosilvopastoral Systems (Poplar Pasture - 29.5 ha, Deciduous Pasture - 6 ha, New Establishment - 26 ha):* These systems combine agroforestry, grazing and arable farming. Rows of poplars and deciduous trees provide shade, fodder and wind protection while improving biodiversity, soil fertility and animal welfare. The large-scale New Establishment demonstrates how multifunctional land-use can scale to deliver food, fibre and ecosystem services.
- *Biodiverse Plantings (Syntropic System - 3.5 ha, Seed System - 2.1 ha):* Highly diverse plantings featuring fruits, nuts, and berries - including sea buckthorn and climate-adapted varieties - focus on resilience, local adaptation and genetic preservation. Field grafting and principles of natural succession support healthier, more sustainable food systems.
- *Keyline System - 2.65 ha:* Rows are planted along contour lines to slow down water flow, reduce soil erosion, improve water infiltration, and enable cultivation on dry, sandy soils.
- *Biotope Networking - 3.8 ha:* A 4.5 km network of planted rows connects isolated forest patches and creates wildlife habitat corridors.
- *Forest Conversion - 7.5 ha:* A pine monoculture is being transformed into a climate-resilient mixed forest with 17,000 trees and 2.5 million seeds - boosting carbon storage, habitat diversity and ecological stability.

Using **Holistic Grazing** as a pasture management technique, around 200 Salers and Angus cattle are rotated daily across the fields. This boosts fertilises soil naturally and supports pasture recovery.

Current Income

- *Products:* Organic pasture-fed beef (field-shot and slaughtered on the farm), leather goods (belts, key rings) and farm-made spirits (e.g. Amaro di Madlitz, Obstler) from apples, berries, herbs and roots.
- *Merchandise:* Branded items like caps, shirts, hoodies, bags and postcards.
- *Services:* Farm tours, events, workshops and consulting.

© Theresa Collmann, Syntropic System, 2025

PRINCIPLE: WORKING WITH, NOT AGAINST

Gut&Bösel brings together farmers, researchers and the wider community. One example is the federally supported **DaVaSus** programme. In this programme, the Finck Foundation works together with the JKI, ATB and KTBL institutes to contribute research, digital tools and technical expertise. In collaboration with additional partners, a **digital twin** is being developed: a geo-referenced tool that captures data from agricultural and forestry land (soil nutrients, water content, yields and weather) to track how these systems are affected by their environmental conditions over time.

Local communities and trainees are actively involved in learning, sharing and applying regenerative practices.

Soil Regeneration with **Regenerative Practices**, including:

- *No-till farming & Mulching:* Direct seeding with cover crops like mustard and lupines, plus undersowing to protect soil and supports humus formation. Mulching with plant residues, wood chips or green waste helps retain moisture, suppress weeds and continuously feeds soil life with organic matter.
- *Composting & ferment extracts:* Fifteen approaches implemented in five different processes produce 260 cubic metres of compost from materials such as manure, leaves, straw, clay, organic waste, hay, silage, wood chips, coal, and rock flour. The composts are tested in agroforestry systems and the tree nursery, as well as used for seed inoculation and extract treatments in arable farming to enhance the soil microbiome and replace synthetic fertilisers.

RESULTS: RISKS AND BENEFITS

A **pilot study** analysed soil microbial communities down to 60 cm depth in two agroforestry systems (agrosilvopastoral and syntropic) compared to adjacent arable land. After just four years, both systems demonstrated that agroforestry significantly shaped microbial diversity and composition, increasing beneficial microbes such as plant-growth-promoting bacteria and mycorrhizal fungi.

By integrating trees such as poplar, willow or hazel into cropland or grassland, agroforestry enhances soil structure, builds humus, reduces erosion and supports water absorption. Ernst Götsch's **Syntropic Farming** takes this further by **mimicking natural succession and layering (stratification)**, increasing soil moisture through dense planting and mulching.

Since 2021, the Finck Foundation and the Leibniz Institute of Freshwater Ecology (IGB) have been researching how such systems influence water availability and groundwater recharge - with promising results, especially in diverse, structurally rich agroforestry systems.

—

- *High initial costs:* Buying trees, materials and installing sensors can be expensive.
- *Time needed:* Trees and soil improvements take years to grow and show results.
- *Complex management:* Managing diverse crops and livestock is more difficult than simple farming.
- *Unsupportive policies:* Rules and subsidies mostly favour simple farms growing just one crop.

+

- *Ecological:* Increased biodiversity, improved soil structure, higher water retention and carbon capture.
- *Social:* Knowledge sharing, job creation and community involvement.
- *Economic:* Multiple income sources, long-term soil productivity and resilience to drought and market shocks.

References

Drastig, K., Zimmermann, B., Ammon, C., & Jacobs, H. (2024). *Water productivity and irrigation water demand of potatoes in Brandenburg (Germany) between 1902 and 2020.* Springer Nature Link. from: https://link.springer.com/article/10.1007/s11540-024-09734-z [retrieved: July 9, 2025]

Finck Foundation. (2025). *Finck Foundation Annual Report: The real-life laboratory for regenerative ecological agriculture and forestry.* Finck Foundation gGmbH. https://www.gutundboesel.org/

Götsch, E. (n.d.). *What ist Syntropic Farming?* Agenda Gotsch. from: https://agendagotsch.com/en/ [retrieved: July 28, 2025]

Gut & Bösel GmbH. (n.d.). Gut & Bösel. from: https://www.gutundboesel.org/ [retrieved: July 9, 2025]

Savory Institute. (n.d.). *Holistic Management.* from: https://savory.global/holistic-management/ [retrieved: July 28, 2025]

Vaupel, A., Küsters, M., Troups, J., Herwig, N., Bösel, B., & Beule, L. (2025). *Trees shape the soil microbiome of a temperate agrosilvopastoral and syntropic agroforestry system.* Scientific Reports. from: https://www.nature.com/articles/s41598-025-85556-4 [retrieved: July 9, 2025]

SUSTAINABLE VALUE CHAIN DEVELOPMENT FOR NẾP CÁI HOA VÀNG AND HIGH-QUALITY RICE VARIETIES IN QUẢNG NINH: AN OCOP INITIATIVE (2020–2025)

This case study examines Quảng Ninh Province's development of a sustainable value chain for Nếp Cái Hoa Vàng (Yellow Sticky Rice) and high-quality rice varieties (J02/ST25) as part of its OCOP agricultural modernization efforts.

BACKGROUND

OCOP Project outcomes: Through provincial policies like Resolution 194/2019 and Decision 1369/QĐ-UBND, Quảng Ninh has established specialized rice zones, promoted VietGAP standards, and incentivized processing upgrades since 2015, achieving 4.4% annual growth in rice production. The OCOP program has certified 191 rice products (3-5 stars), with exports reaching premium Asian markets.
Challenges: Remain in scaling production, improving post-harvest technology, and strengthening farmer-processor linkages.
Solution: This rice-focused initiative directly addresses these gaps through mechanization, contract farming models, and the 2020-2025 Provincial Rice Value Chain Development Plan.

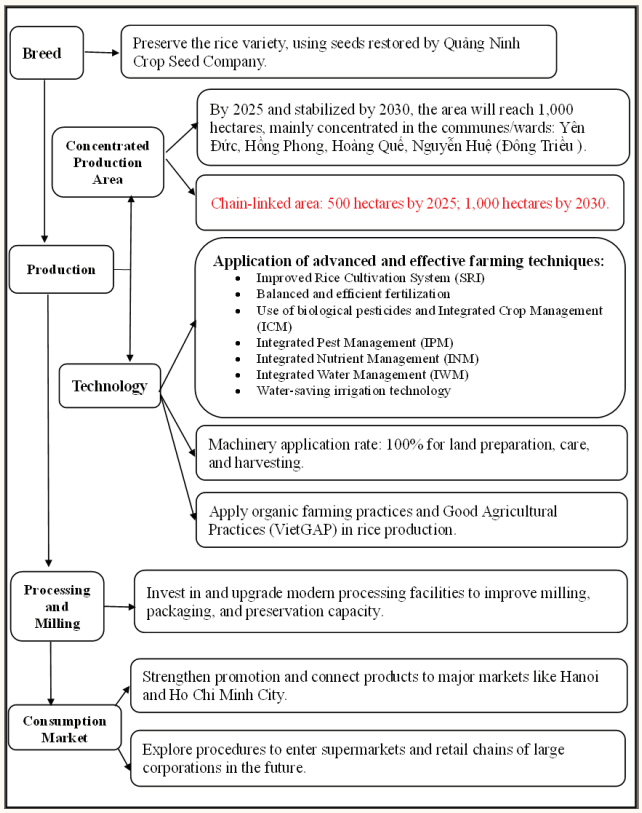
PROJECT PROFILE

- **Location:** Quảng Ninh, Việt Nam
- **Species involved:** Nếp Cái Hoa Vàng (Yellow Sticky Rice) and High quality rice (J02/ST25)
- **Stakeholders involved:** Quảng Ninh Crop Seed Company, Hoa Phong Cooperative and Provincial Agriculture Department
- **Goals:** Develop agri-value chains, Boost quality and food safety, Scale high-tech/organic production zones, Enhance export competitiveness, Support agricultural restructuring for sustainable development
- **Main challenges:** Market competition, Technology transfer, by-product utilization

- **Nếp Cái Hoa Vàng:**
- Aromatic sticky rice
- Drought/pest-resistant
- Traditional uses (alcohol, festivals)

- **J02 (Japanese's landrace):**
- Early-maturing
- Disease-tolerant/ Adapts to poor soils
- **ST25 (Vietnamese's landrace):**
- world's best rice 2019
- Climate-resilient

IMPLEMENTATION APPROACH



RICE VALUE CHAIN DIAGRAM

AGROBIODIVERSITY ASPECT

Genetic diversity of crops and livestock
- Conservation of Nếp Cái Hoa Vàng (traditional landrace) alongside J02/ST25 (modern high-yielding varieties).
- Livestock: Integrated rice-duck-fish systems in Yên Đức.

Diversity of agricultural management
- Practices include SRI, ICM, IPM, INM, IWM, drone spraying and laser land levelling, automatic irrigation.
- Strong integration of local and high-tech practices.

Diversity of production and food supply systems
- Parallel chains for glutinous and high-quality rice products (ST25, J02).
- Processing: two-stage drying, one-pass milling, vacuum packaging.
- Deep processing into rice milk, bran oil, cosmetics, organic fertilizer, biochar, etc.

Diversity of stakeholders
- Farmers (individual and cooperatives (HTX Hoa Phong, Hoàng Quế).
- Government (policy, land planning).
- Private processors and retailers.
- Seed companies (Quảng Ninh Crop Seed Company)).
- Input/service providers.

CONCLUSION

Key Achievements
✓ Preserved agrobiodiversity: saved herritage rice and boosted hybrids landraces , enhancing genetic resilience.
✓ Scaled sustainably: 1,000 ha of VietGAP-certified rice zones (2030) with 100% mechanization and 14%→<8% post-harvest losses.
✓ Boosted livelihoods: Linked 500+ households to premium markets (Hanoi/HCMC), doubling profits for chain participants.

Policy Impact
Quảng Ninh's OCOP model demonstrates how provincial policies can:
1. Bridge gaps: Connect smallholders to tech (drones, silos) and markets (BigC, Metro).
2. Balance tradition & innovation: Organic practices + modern processing (2-stage drying, bran oil).

Next Steps:
- Expand deep processing (rice bran cosmetics, straw biofuels).
- Replicate the chain for other OCOP products (e.g., Dam Hà's Bào Thai rice).

REFERENCE:
- Long, Hoang Thanh & Ta, Nhat Linh & Dang, Hao & Ho, Thi & Lebailly, Philippe. (2018). One Village One Product (OVOP)—A Rural Development Strategy and the Early Adaption in Vietnam, the Case of Quang Ninh Province. Sustainability. 10. 4485. 10.3390/su10124485.
- Quảng Ninh People's Committee. (2022). Report on the Provincial Key Agricultural Product Value Chain Development Project for 2020–2025, Vision to 2030]. Quảng Ninh, Vietnam.

Van Dao: van.dvt511@gmail.com

GROWING FUTURES - FROM SEED TO SOCIETY:
Learning Agrobiodiversity with AckerSchweiz

Janina Storjohann, storjjan@students.zhaw.ch, ZHAW Agrobiodiversity Summer School, August 2025

THE ORGANIZATION: Acker

Acker is an educational non-profit organization operating in Germany (since 2014), Switzerland (2020), and Austria (2021). Through its educational programs, it brings vegetable diversity, sustainable nutrition, and nature-based knowledge directly into kindergartens and schools.

This case study aims to explore the role of crop variety, structural challenges, and the opportunities of this educational approach in promoting agrobiodiversity. The analysis is based on an interview with Simone Kobel, co-director of AckerSchweiz.

Acker & AGROBIODIVERSITY

- Genetic diversity of crops
- Diversity of stakeholders
- Diversity of agricultural management practices & intensities
- Species diversity within crops

IMPACT & REACH

Experiential biodiversity education: Cultivating over 30 plant species and 250 varieties, offers children direct insights into vegetable growth and the importance of healthy soils for sustaining biological diversity.

High motivation and curiosity: 93% of children harvest enthusiastically; 83% try previously unknown vegetables.

Enhanced ecological and nutritional literacy: The program fosters appreciation for sustainable diets and responsible food choices.

Social benefits: Teachers report improved relationships with children, and school gardens become spaces of shared experience and community-building.

CHALLENGES & FUTURE NEEDS

Seed availability: Not all regional nurseries offer open-pollinated or rare varieties, limiting diversity in practice.

Structural disparities: Support varies significantly between cantons; some schools benefit from local funding, while others lack institutional backing.

Short-term funding cycles: Most funding is limited to 1–3 years, complicating long-term planning and program continuity.

CONCLUSION

AckerSchweiz enables hands-on access to plant diversity through child-centered, experiential gardening activities. It demonstrates how agrobiodiversity can become tangible and meaningful even at early educational stages.

However, structural instability and policy gaps hinder long-term impact. Sustainable transformation requires consistent political support and the systemic integration of biodiversity education.

REFERENCES & FIRGURES

All data and firgures presented are based on a personal interview with Simone Kobel, Co-Director of AckerSchweiz, the official website (www.acker.co; accessed June 2025) or the 2024 impact report of AckerSchweiz.

AckerSchweiz. (2024). Wirkungszahlen 2024 – GemüseAckerdemie Schweiz. Retrieved June 20, 2025, from https://www.acker.co/gemueseackerdemie-schweiz/Wirkung-ch/Wirkungszahlen2024

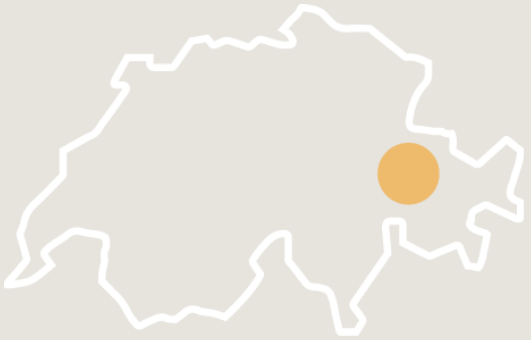
Summer School Agrobiodiversity

zhaw Life Sciences und Facility Management

IUNR Institut für Umwelt und Natürliche Ressourcen

Scalottas terroir

ROOTED IN TERROIR – REVIVING AGROBIODIVERSITY THROUGH CULINARY EXPERIENCES



The BergAcker is a mountain garden project initiated in the year 2019 by the hotel Schweizerhof in the Lenzerheide in the Swiss Alps. Located at 1,500 meters above sea level, it connects regional agriculture with gastronomy through hands-on cultivation of traditional and climate-resilient crops. The goal is to foster awareness, deepen food literacy, and inspire both guests and staff to engage with the challenges of climate change and agrobiodiversity.

AGROBIODIVERSITY ASPECTS

Diversity of agricultural management practice: Exchanging knowledge from different perspectives also in the topic of management practice. Used is mostly traditional management practices as in the "old days". Inputs are also given by older community members.

Diversity of production and food supply systems: Testing new crops on the height of the Bergacker, bringing in diversity in the crop rotation always in collaboration and with a thought of biodiversity.

Diversity of stakeholders: Bringing different stakeholders together, talking about the food system and crops in their view of point.

CHALLENGES

Economic viability: The project requires intensive manual labour and seasonal care, which makes it difficult to scale and economically justify in a conventional business model.

Climate Change: Increasing weather extremes in alpine regions (e.g., heavy rains, droughts, late frost) threaten crop yields and make long-term planning more difficult.

Staff continuity and knowledge transfer: Maintaining continuity in know-how and motivation among seasonal staff can be challenging in a hotel environment.

Scalability: Due to its small size, high maintenance, and context-specific setup, the BergAcker is not easily replicable in other hospitality operations without strong local engagement.

RECENT ACHIEVEMENT

2024 Cook of the year by Karl Wild

BENEFITS (3 PILARS SUSTAINABILITY)

Ecological: The BergAcker enhances soil health, supports pollinators, and preserves agrobiodiversity by growing diverse and often forgotten regional varieties.

Social: It fosters awareness and dialogue between farmers, hotel staff, and guests, strengthening regional identity and food literacy.

Economic: By integrating local produce into the kitchen and storytelling, the project adds value to regional products and supports short value chains.

CONCLUSION

The BergAcker demonstrates how even small-scale, symbolic interventions can create strong experiential links between food, people, and place. By embedding agrobiodiversity into the hotel's everyday culture and guest experience, it shows a scalable model for climate awareness and regional pride in the hospitality sector.

REFRENCES

- https://scalottas-terroir.ch/
- https://www.biovision.ch/story/leuchtturm-scalottas-terroir/

CONTACT

Naomi Koepfli
naomi.koepfli@hotmail.com