Climate Resilience Enhancement in Dairy Farming (CliResDairy)
Türkiye, Aydin

Hediye Cerit
Project Coordinator

Cattle Breeders' Association of Aydin
Barcelona, 11 June 2025

CLIMAAX
climate ready regions

Multi-Dimensional Risk Landscape of Dairy Farming in Aydin

Aydin plays a vital role in Türkiye's agricultural economy with its strong focus on agriculture, agri-industrial production, and a thriving dairy sector. The CliResDairy project tackles these vulnerabilities through a multi-risk climate assessment, emphasizing the economic, environmental, and European policy dimensions of resilience.

ECONOMICS

- 55% of Aydın's population earns their livelihood from agriculture.
- 10 of Türkiye's 25 priority agricultural products are produced in the region.
- Aydın is the 4th leading province in Türkiye for cultural breed cattle and 8th in overall cattle population.
- Aydın holds 5.15% of Türkiye's total cattle population.
- It has 5.34% of all dairy cows in the country.
- The average number of cows per farm is 22 (national average: 16).
- The average number of total cattle per farm is 49 (national average: 37).
- The average milk yield per cow (305 days) is 6,336 kg (109% of the national average).

ENVIRONMENT

- Prolonged droughts, extreme temperatures, and unpredictable weather events, threatening the sustainability of its dairy sector.

- Rising temperatures and declining precipitation have led to more frequent heatwaves and dry spells (IPCC, 2022).

- Inefficient irrigation practices, with nearly 99% relying on traditional flood methods, exacerbate water scarcity and groundwater depletion (FAO, 2018).

EUROPE

By adopting EU-aligned climate risk methods, the project supports sustainable dairy farming and strengthens regional policy integration across European agricultural systems.

CliResDairy: Climate Resilience Enhancement In Dairy Farming

➢ **The main objective of the project** is to enhance climate resilience in the dairy farming sector, with a primary focus on AYDIN Province, within the broader Aegean Region.

➢ By implementing multi-risk climate assessments and developing targeted adaptation strategies, the project will contribute to the sustainability of agricultural livelihoods in AYDIN, reduce vulnerabilities to climate risks, and strengthen local capacity to adapt to changing climate conditions.

• Improve the sustainability of agricultural livelihoods by identifying and mitigating key climate risks.

• Strengthen local capacities to adapt to changing climatic conditions through training and knowledge-sharing initiatives.

• Provide data-driven insights for policymakers, enabling the integration of climate adaptation strategies into regional and national agricultural planning.

• Promote sustainable water and resource management practices to reduce environmental stress and improve efficiency in dairy farming.

•Encourage the adoption of climate-smart agricultural technologies to enhance productivity and resilience in the sector.

The Cattle Breeders' Association of Aydin (CBAA)

ADSYB — AYDIN İLİ DAMIZLIK SIĞIR YETİŞTİRİCİLERİ BİRLİĞİ

Established in **1995**, the organization has **4,116** members and plays a pivotal role in supporting dairy farms within the province. With a workforce of **48 employees** across five specialized departments, it is dedicated to disseminating knowledge and fostering sustainable production practices among its member dairy breeders.

Project Team

- Project Coordinator: **Hediye Cerit**
- **Technical Department of Cattle Breeders' Association of Aydin**

External Consulting Services

- o **Dr. Çağrı Karaman**: Technical Advisor (International Climate Analysis and Model Development Expert)
- o **Assoc. Prof. Nusret Demir**: Technical Advisor (Geomatics & Industrial Engineer)
- o **M. Kemal Demirkol**: Technical Advisor (Climate Adaptation, Risk Assessment)
- o **Engin Koç**: Technical Advisor (Climate Adaptation, Risk Assessment)
- o **Elif İrem Köse Kiper**: Technical Advisor

Key Stakeholders

- Ministry of Agriculture and Forestry - Aydin Provincial Directorate
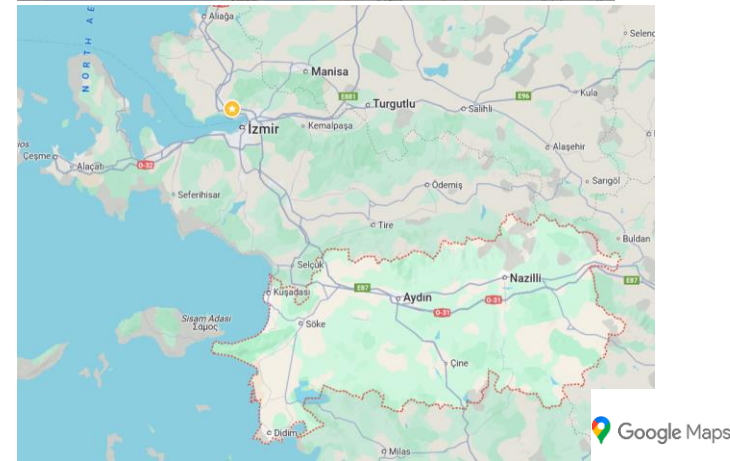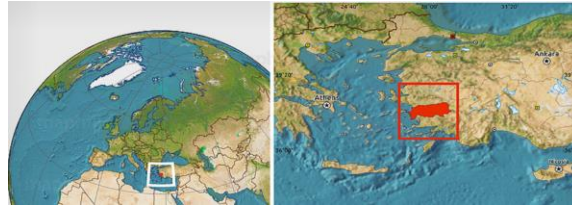- Aydin Adnan Menderes University- Faculties of Agriculture and Veterinary Medicine

Others

-Ministry of Environment, Urbanization, and Climate Change – Aydin Provincial Directorate
-Aydin Meteorology Provincial Directorate
-Aydin Irrigation Union
-Aydin Metropolitan Municipality
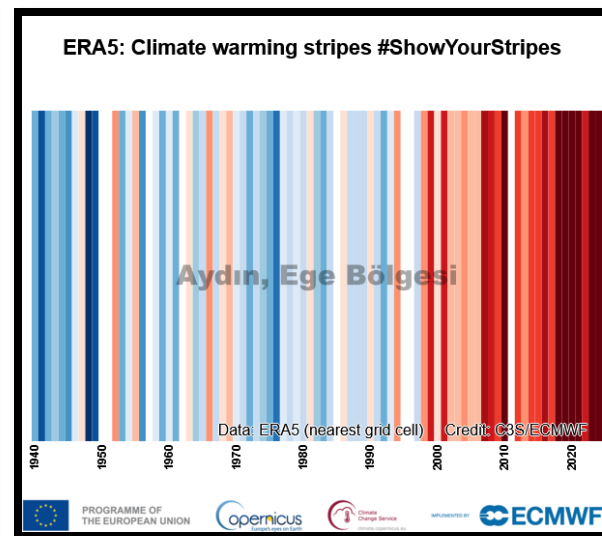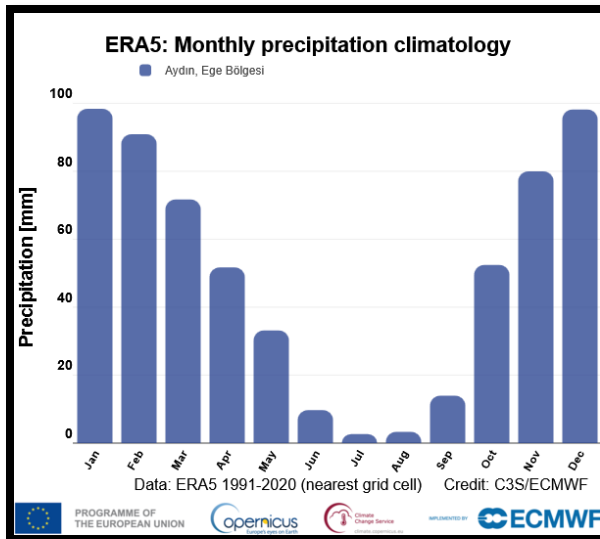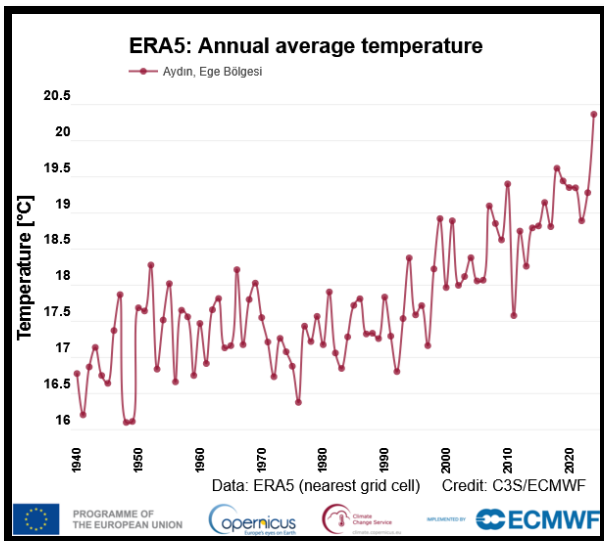-Agricultural Organizations
-Environmental and Agricultural NGOs

Geographical Location of AYDIN Province

- Located in the Aegean Region of Türkiye, covering an area of 8,116 km².
- Located in the southwestern part of the Aegean Region in the west of Anatolia and in the Büyük Menderes Basin,

- Population: approximately 1.16 million.(2023)
- Climate: Mediterranean, with hot summers and mild winters.
- Economic focus: Agriculture, agri-industrial production, and tourism.
- Agricultural Products: Olive oil production, figs, and a thriving dairy farming sector.
- Strategic importance: A key contributor to Türkiye's agricultural and export economy

Temperature and Precipitation Changes in AYDIN, Aegean Region

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Screening Risks

Aydin's climate is highly favorable for agriculture, particularly for crops that thrive in warm temperatures, but the dry summers necessitate irrigation.

The combination of high summer temperatures and low rainfall increases the risk of drought, making water management crucial.

Extreme heat waves in July and August pose challenges for both public health and agriculture.

Overall, Aydin's climate supports tourism and year-round agricultural activities, though sustainable water management and adaptation to extreme heat events remain essential considerations.

Feed Storage
- Farmers
- Ministry of Agriculture and Forestry
- Aydın Provincial Directorate of Agriculture and Forestry

Dairy Farming
- Dairy Farmers
- Veterinarians and Animal Health Experts
- ADSYB

Milk& Meat Production
Processing and Production Facilities

Waste Management
Consumers

Feed Production& Supply
- Feed Suppliers& Producers
- Directorate General for State Hydraulic Works (DSI)
- Local Irrigation Unions and Cooperatives

Feed Logistic
Transport& Logistic Providers

Milk Collection& Storage
- Milk Collectors

Market& Distribution
- Cooperatives and Sectoral Associations
- Retailers

Potential Risks Across Value Chain and Possible Adaptation Interventions

Dairy Value Chain Stage	Climate Risks	Adaptation Strategies
Feed Production	Drought reduces crop yields and limits water access (FAO, 2018).	Implementing drought-resistant feed crops and optimizing irrigation systems. Establishing regional fodder banks to mitigate supply fluctuations.
Storage	Increased temperatures cause spoilage (FAO, 2021).	Insulated storage facilities, temperature/humidity control, and improved ventilation. Adoption of predictive inventory management systems to reduce waste.
Transportation	Extreme weather disrupts logistics (IPCC, 2022).	Developing alternative logistics routes and increasing supply chain flexibility. Investment in climate-resilient transport infrastructure.
Animal Health	Higher temperatures increase disease prevalence (University of Florida, 2021).	Improved barn ventilation, cooling systems, and vaccination programs. Enhanced monitoring of heat stress indicators using AI-driven tracking tools.
Milk Production	Heat stress lowers milk yield (University of Wisconsin-Madison, 2018).	Shade structures, misting fans, and optimized feed rations. Genetic selection for heat-tolerant cattle breeds.
Processing	Power outages disrupt operations (IEA, 2021).	Investing in backup energy sources (solar, biogas) and energy efficiency measures. Automation of critical cooling and processing functions to reduce energy loss.
Marketing & Distribution	Heatwaves impact cold chain integrity (Cold Chain Technologies, 2020).	Advanced refrigeration technologies and climate-resilient distribution planning. Expanded use of sustainable packaging materials to reduce temperature sensitivity.

Data Overview Used For Hazard and Risk Assessment

| Data Overview	Hazard data	Vulnerability data	Exposure data	Risk output
Workflow 1: Extreme Precipitation	Projected increase in heavy rainfall events (e.g., 100 mm/24h return period changes)	*Sensitivity of dairy cattle to extreme weather conditions*	*Number and location of dairy farms in flood-prone areas*	*Increased risk of flooding in dairy farms*
Workflow 2: Heatwaves	KNMI-RACMO22E RCM (ICHEC-EC-EARTH GCM). The xclim methodology to calculate heatwave metrics such as frequency, average length, and total yearly heatwave days for the historical, and projected periods under RCP 4.5 and RCP 8.5. Heatwaves were defined as periods of at 3 days with daily maximum temperatures above 35°C and minimum temperatures above 20°C.	*Dairy farm density in the Aydin region. Farms are classified as low vulnerability (1) and high vulnerability (10).*	*Euroheat bias-adjusted climate projections with population density data.*	*10x10 risk matrix, combining heatwave occurrence data with dairy farm vulnerability.*
Workflow 3: Drought/Agricultural Drought	Precipitation deficit leading to yield loss in maize, wheat, sorghum, and barley. Daily mean precipitation, temperature, relative humidity, solar radiation, wind speed. Soil available water capacity, elevation, and thermal climate zone	*Share of cropland with irrigation systems.*	*Crop distribution and economic value data Global Agro-Ecological Zones (GAEZ).*	*Revenue losses from irrigation deficit expressed as 'lost opportunity cost' in thousand euros.*
Workflow 4: Flooding/River Flooding	High-resolution flood maps for Europe from JRC, flood extents for different return periods (10, 50, 100, 200, 500 years), flood hazard in Aydin region, particularly along the Büyük Menderes River.	*Global flood depth-damage functions (vulnerability curves) from JRC (Huizinga et al., 2017).*	*Land use/land cover map from JRC (LUISA Base Map 2018) for urban areas, agricultural fields, infrastructure, and water bodies.*	*Flood Risks to build infrastructure, flood and associated damages maps for extreme event in Aydin (10, 50, 100, 200, 500 years)*

Risk Assessment: Extreme Precipitation

Many of the dairy farms are concentrated in areas experiencing some of the highest increases in extreme rainfall.

This possesses a possible risk about potential impacts on infrastructure, pasture conditions, and overall dairy production.

Increased heavy rainfall could lead to flooding and possible damage to supply chains and transportation networks, posing risks to the sustainability of dairy operations.
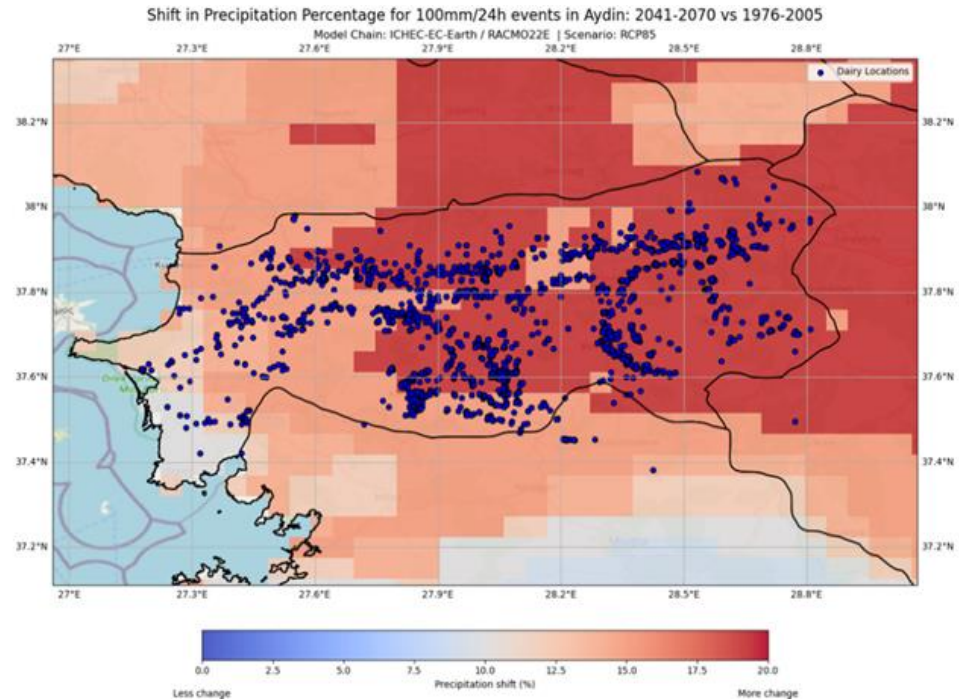

Figure. percentage shift in precipitation within the Aydin region, highlighting the most significant changes in the frequency of 100 mm/24h events across the dairy locations.

Risk Assessment: Heatwaves

The central and southeastern parts of Aydin are the most vulnerable to increasing heatwave risk, putting many dairy farms at greater exposure to intense heat stress.

The western and northern areas show relatively lower vulnerability, offering potential refuges from extreme heat impacts.
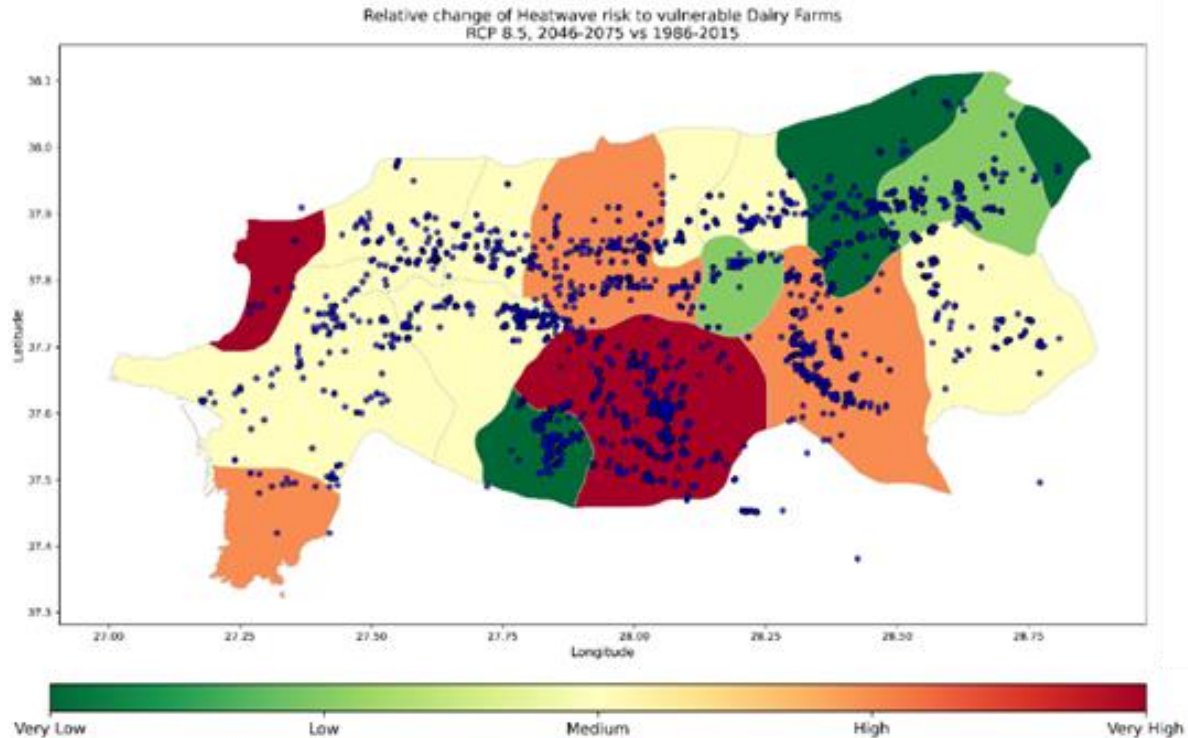

Figure. Heatwave risk to vulnerable dairy farms model chain: ICHEC-EC-Earth / RACMO22E | RCP85

Risk Assessment: Agricultural Drought

The map highlights areas where revenue losses are expected to be most severe, with some regions showing losses exceeding 400 USD per hectare for maize and substantial losses for wheat as well.

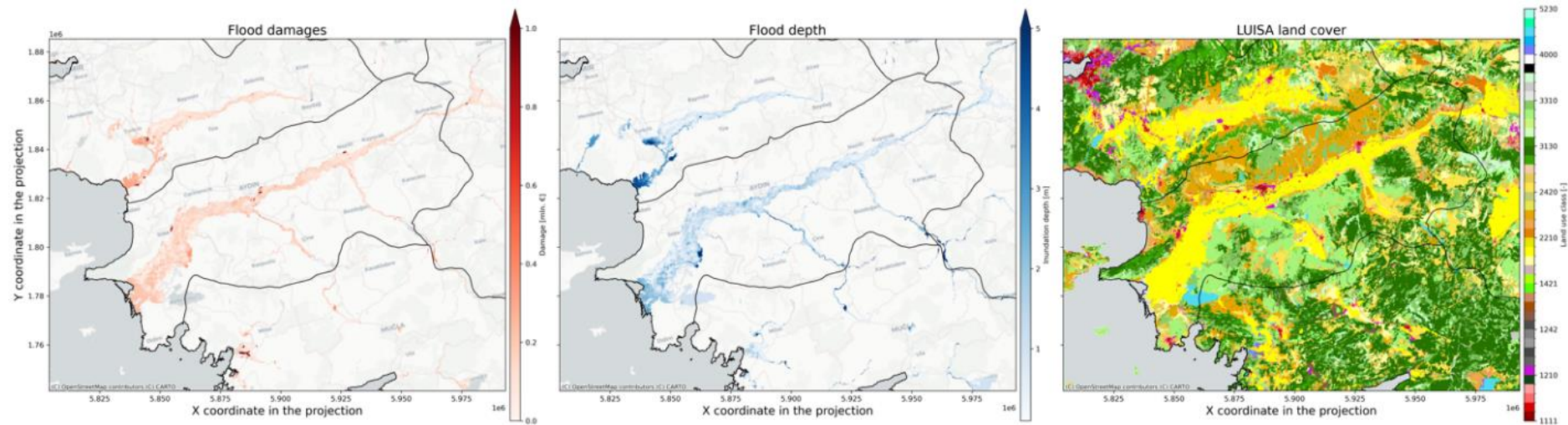The losses concentrated in the southwestern and central parts of the region.
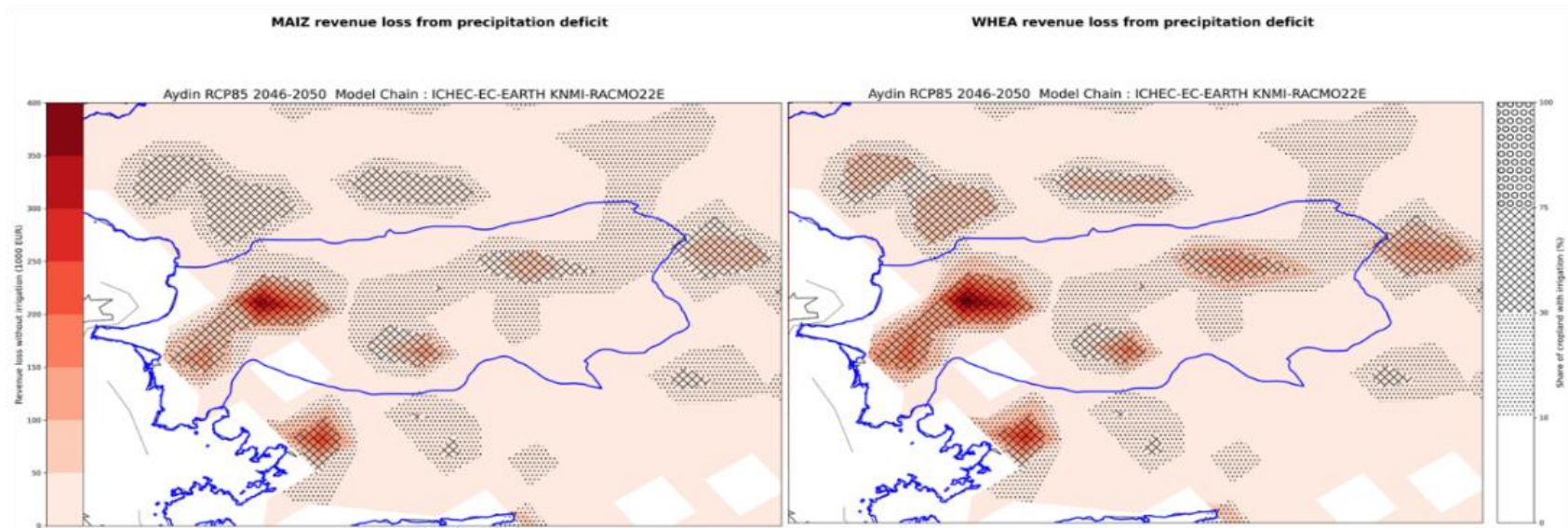
Figure. Maize (left) and wheat (right) revenue loss due to precipitation deficit in the region between 2046-2050 under the RCP8.5 scenario.

Risk Assessment: River Flooding

The extent of damage shown in this map suggests that farms located near rivers and low-lying regions need proactive flood adaptation measures.

Maps highlight the need for strategic planning in dairy farming to mitigate flood risks.

Figure. The maps of flood and associated damages for extreme river water level scenarios in current climate 1 in 100-year extreme event for Aydin Region.

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Thanks