

# **Preparing the agriculture risk maps (abrupt price and supply changes because of the weather conditions) over ECO region**

**( Phase 1: Preparing weather-related risk maps over Iran)**

## **Abstract**

Risk management is part of a farmer's business strategy since production is subject to many uncertainties that could threaten returns or even the viability of farms. The sources of risk in agriculture are numerous and diverse. The five general types of risk in agriculture are as follows: Production, Market, Institutional, Personal, Financial. 1) Production risks stem from the uncertain natural growth processes of crops and livestock, with typical sources of these risks related to weather and climate (periodic deficit or excess rainfall, varying temperatures, hail storms, strong winds, floods, droughts, hurricanes, cyclones, typhoons.) and pests and diseases. Other yield-limiting or yield-reducing factors are also production risks such as excessive heavy metals in soils or soil salinity. 2) Market risks largely focus on uncertainty with prices, costs, and market access. Sources of volatility in agricultural commodity prices include weather shocks and their effects on yields, energy price shocks and asymmetric access to information are additional sources of market risk. Other sources of market risk include international trade, liberalization, and protectionism as they can increase or decrease market access across multiple spatial scales. Farmers' decision-making evolves in a context in which multiple risks occur simultaneously, such as weather variability and price spikes or reduced market access 3) Institutional risks relate to unpredictable changes in the policies and regulations that effect agriculture, with these changes generated by formal or informal institutions. A government, a formal institution, may create risks through unpredictable changes in policies and regulations, factors over which farmers have limited control. Sources of institutional risk can also derive from informal institutions such as unpredictable changes in the actions of informal trading partners, rural producer organizations, or changes in social norms that all effect agriculture. Farmers are increasingly supported by and connected to institutions, especially as farm production becomes more market focused. 4) Personal risks are specific to an individual and relate to problems with human health or personal relationships that affect the farm or farm household. 5) Financial risk refers to the risks associated with how the farm is financed and is defined as the additional variability of the farm's operating cash flow due to the fixed financial obligations inherent in the use of credit. Some sources of financial risk include changes in interest rates or credit availability, or changes in credit conditions.

In many parts of the world, weather represents one of the major uncertainties affecting the performance and management of agricultural systems. Due to global climate change, the climatic variability and the occurrence of extreme weather events is likely to increase leading to a substantial increase in agricultural risk and the destabilisation of farm incomes. Therefore, the predicted impacts of climate change have increased the importance of effectively managing weather risk.

Both seasonal and regional variability in weather directly influence crop yield potential. Extreme temperatures, hailstorm, droughts, floods, wind-storms are just a few examples of weather risk events that cause major economic losses. In developing countries, weather risk is

especially significant due to the importance of the agricultural sector in the overall economy and its contribution to household food security.

Most studies of the influence of weather and climate on food production have examined the influence on crop yields. However, climate and weather influence all components of crop production, includes cropping area (area planted or harvested) and cropping intensity (number of crops grown within a year). Therefore, Weather Risk Assessment requires two sources of historical input: (1) A list of weather elements deemed relevant to the weather risk, and (2) a metric of the weather-related risk.

Managing vulnerability and boosting productivity in agriculture is possible through weather risk mapping. Weather risk mapping can provide historical (past), diagnostic (present) and prognostic (future) analyses of weather patterns in a given zone, allowing agricultural sector stakeholders to better understand weather conditions. When applied as part of a systemic approach to weather risk management, this tool can be used strategically to manage risk and optimize farm productivity. Weather risk mapping techniques are expected to enable more risk-informed planning of production, to facilitate improved information for supply chain stakeholders on potential production risks to crops in given production zones, and to help inform investment.

Iran is one of the world's water-scarce regions and is extremely vulnerable to the impacts of climate variability and climate change due to its high dependency on climate-sensitive agriculture. For Instance, production was reduced significantly by severe drought from 1999-2001, leading to heavy losses in livestock and cereal production. Agriculture remains one of the largest employers, accounting for about 24.2 percent of all jobs and 10.4 percent of GDP. In 2019, the agricultural sector accounts for about 32.5% of the GDP and employs 17.8% of the workforce. Since the sector is the primary source of income, employment, and food, absent effective risk management strategies, weather shocks to agriculture in this country have far-reaching effects on well-being, development, and poverty reduction.

Regard to the above mentioned subjects, preparing the agriculture risk (abrupt price and supply changes because of the weather conditions) maps are of the most important objectives of the ECO Regional Center for Risk Management of natural disasters (ECO-RCRM) in promoting economic growth in the ECO region.

Therefor, the main goal of this project is to develop initial analysis and mapping products to begin to build a framework for addressing agricultural risks of adverse weather and climate change.

The objectives of developing the agriculture weather risk maps are as bellow:

- i. Identify weather and climate extreme events including: periodic deficit or excess rainfall, varying temperatures, hail storms, strong winds, floods, droughts, ... ,
- ii. Evaluate the risk of weather related hazards (the metrics),
- iii. Preparing agricultural weather/climate risk maps related to all strategic crops.

In order to have a general and comprehensive outlook of the project, a team of experts from the Climatological Research Institute - Atmospheric Science & Meteorological Research Center

in Iran(CRI-ASMERC), IRIMO, FAO and ECO Regional Center for Risk Management of natural disasters (ECO-RCRM) in collaboration with relevant ministries and national institutions will review the current risk mapping analyses based on historical weather observations, which are typically used for risk identification and assessment, including climatologist, hazard and risk maps and climate regionalization. This team will try to set up a mechanism to access and operationalize raw data for designing and establishing of weather-related disasters database, to undertake a GIS based mapping of these disasters, disaster risk indices developed and assessed for country and to develop a database on disaster impacts and GIS based mapping of disaster indices and analysis of disaster risk indices.