

Technology Fact Sheet for Adaptation

F. Risk-coping production systems (RCPS)ⁱ

Sector : Agriculture	
Subsector : orchards, rainfed crops, and irrigated field crops	
Technology characteristics	
Introduction	“Risk-coping production systems (RCPS) resilient to water and land modifications require diversified structure in space and time such as: - Crop rotation - Agro-forestry - Crop-livestock associations - Terracing - Landscape practices: hedges, windbreaks, vegetative buffer strips, etc. Accomplished they can have an enormous impact on adaptation to drought, heavy rains and winds” (FAO).
Technology characteristics/highlights	- RCPS technologies in our local context would include: ✓ Crop rotation ✓ Agro-forestry ✓ Crop-livestock associations ✓ Terracing ✓ Windbreaks - Most of these practices have been historically practiced in Lebanon. - Adapting RCPS to some crops may require large areas (i.e. crop rotation, crop-livestock association and agro-forestry) but mostly local knowledge - Some landscaping adaptation features (i.e. terraces) require high investments and are specific to mountainous areas. - Agro-forestry is applicable under special agro-climatic and social (land tenure) conditions. - Windbreaks are the lowest in cost and efficient in plains as a mean to protect from heavy winds.
Institutional and organizational requirements	- All these technologies are directly implemented by farmers, however institutional requirements are necessary in the following cases: ✓ Terrace construction may require some license from local authorities. ✓ Crop-livestock association system has also some institutional requirements if close to urban areas. - Agro-forestry is applied in areas where cadastral delimitation and land ownership are ambiguous, while windbreaks are found in the opposite context. - The Green Plan funds terracing for farmers, on a demand-driven basis. - Organizational requirements between the Ministry of Agriculture, NGOs and research institutes are essential to ensure knowledge transfer, training and capacity building for agriculture systems (crop rotation, agro-forestry, and crop-livestock associations).

Operation and maintenance	- Terraces may need minimal operation and maintenance as well as windbreaks. - Agro-forestry, crop rotation and crop-livestock associations are dynamic agriculture systems that require continuous operations.
Endorsement by experts	RCPS is widely acknowledged worldwide, as most of its features are inherited as local knowledge from around the world. In Lebanon, terraces have been historically constructed and constitute a major national heritage. Windbreaks are common in plains. Nevertheless, the dynamic agriculture systems are currently less welcomed by farmers.
Adequacy for current climate	RCPS is adequate under actual and future climate conditions.
Scale/Size of beneficiaries group	The size or scale of beneficiaries depends on the type of the production system: - Crop rotations are mainly for field crop growers in large holdings - Windbreaks for agriculture holdings in coastal and inland plains - Terraces are for agriculture lands on mountain slopes - Agro-forestry in semi-arid and sub-humid zones under specific socio-economical and environmental conditions - Crop-livestock associations in agriculture areas, distant from cities
Disadvantages	Farmers renting holdings on a short term basis contract cannot take advantage from RCPS. Small holders are unable to apply economically viable crop rotations or crop-livestock farming systems.
Capital costs	
Cost to implement adaptation technology	Cost depends on the type of technology: - Windbreaks/Agro-forestry: the cost is minimal (cost of seedlings and planting). - Crop rotation: no initial investment is required rather than the cost of production. - Terracing: around 7\$/m² of terrace stone wall. - Crop-livestock association: it is difficult to estimate as it depends on the type of crops and animals, as well as the scale of the exploitation.
<u>Additional</u> cost to implement adaptation technology, compared to "business as usual"	The additional cost is reduced to the seedlings cost for windbreaks and agro-forestry (i.e. 3 to 10\$/seedling). Terraces may cost 5 to 10\$/m ² of terrace depending on the site condition. In the other technologies, the cost depends on what is "missing" (i.e. forest trees and land preparation in agro-forestry; livestock establishment in mixed farming systems...).
Long term cost (i.e. 10, 30, or 50 years) without adaptation	N/A
Long term cost (i.e. 10, 30, or 50 years) with adaptation	N/A
Development impacts, direct and indirect benefits	
Direct benefits	- Increased farmer's resilience by diversified production and reduced direct impact of climate on land and crops. - Increases in income might be observed on the long run in crop rotation as soil fertility is preserved, and pest cycles are broken (less inputs).

Reduction of vulnerability to climate change, indirect	Soil degradation and erosion are reduced. Wind and drought are reduced. Animals and crops are less vulnerable and diversity in the farming system increases their resilience.
Economic benefits, indirect Employment Growth & Investment	Generally no change in employment occurs, but diversification of the employment type is generated. However, in some cases (i.e. terraces) employment increase as labor is required. Investment in crops, animal husbandry and infrastructure (agriculture machinery, terraces...) is required, which would enhance growth. Technicians and labor in terrace construction, animal husbandry and nurseries will profit from these investments to achieve some growth.
Social benefits, indirect	Since yield is expected to increase on the long run with an overall yield stability due to the reduced impact of climate adverse, farmer's income is hence increased. Time, money and energy savings from eventual damage reparation are expected.
Environmental benefits, indirect	- Better nutrient use efficiency (especially in crop-livestock and agro-forestry), and hence reduction of inputs and pollution. - Soil and water conservation in terraces. - Carbon fixation and sequestration are enhanced in agro-forestry and when windbreaks are planted. Increased biodiversity and reduced land degradation in general.
Local context	
Opportunities and Barriers	Land tenure system and land zoning could be sometimes a barrier for applying RCPS. Some laws hinder the promotion of crop-livestock systems in agriculture areas closer than 500m from human settlements, which is a serious handicap in areas with high population density (i.e. Mount Lebanon and the South). RCPS, through its various features is also an opportunity to combat desertification and reduce land degradation, and enhance mitigation actions.
Market potential	RCPS is a non-market technology by itself. The construction of terraces and plantation of windbreaks may increase the market of the stone factories and nurseries...
Status	If terracing and windbreak plantation are common in Lebanon, dynamic agriculture systems are still at their beginning. - Terracing is widely encouraged and subsidized by the government through the activities of the Green Plan. - Crop rotation is promoted along with conservation agriculture by ICARDA/GIZ/ACSAD/AUB, - Mixed farming systems (crop-livestock) are mainly adopted by some growers, mainly organic farmers. - World Vision is promoting a new concept of agro-biodiversity which may have a double objective: reforestation of landraces and improving the livelihood of farmers in semi-arid areas.
Timeframe	Medium to Long Term
Acceptability to local stakeholders	Windbreaks are being cut by most farmers to use them as fuel wood and expand their farm surface. Crop rotation, agro-forestry and crop – livestock associations require several years of demonstration to convince

	farmers of adopting them, according to their different local contexts.
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ⁱ **This fact sheet has been extracted from TNA Report – Technology Needs Assessment Reports For Climate Change Adaptation – Lebanon. You can access the complete report from the TNA project website <http://tech-action.org/>**