

### 7.5.5 Technology Action Plan for Rainwater Harvesting from Roads

#### Target for technology transfer and diffusion

Since the establishment of agriculture roads and water harvesting equipments are demand driven under the Green Plan's policy, the target for the below action plan (Table 81) is to achieve RWHR over 50km of roads between 2015 and 2025. Beneficiaries will be farmers having their exploitations along these roads. The estimated cost is USD 70,000 per 1Km of roads, or 3.5 million USD to achieve a target of 50km over a 10-year period.

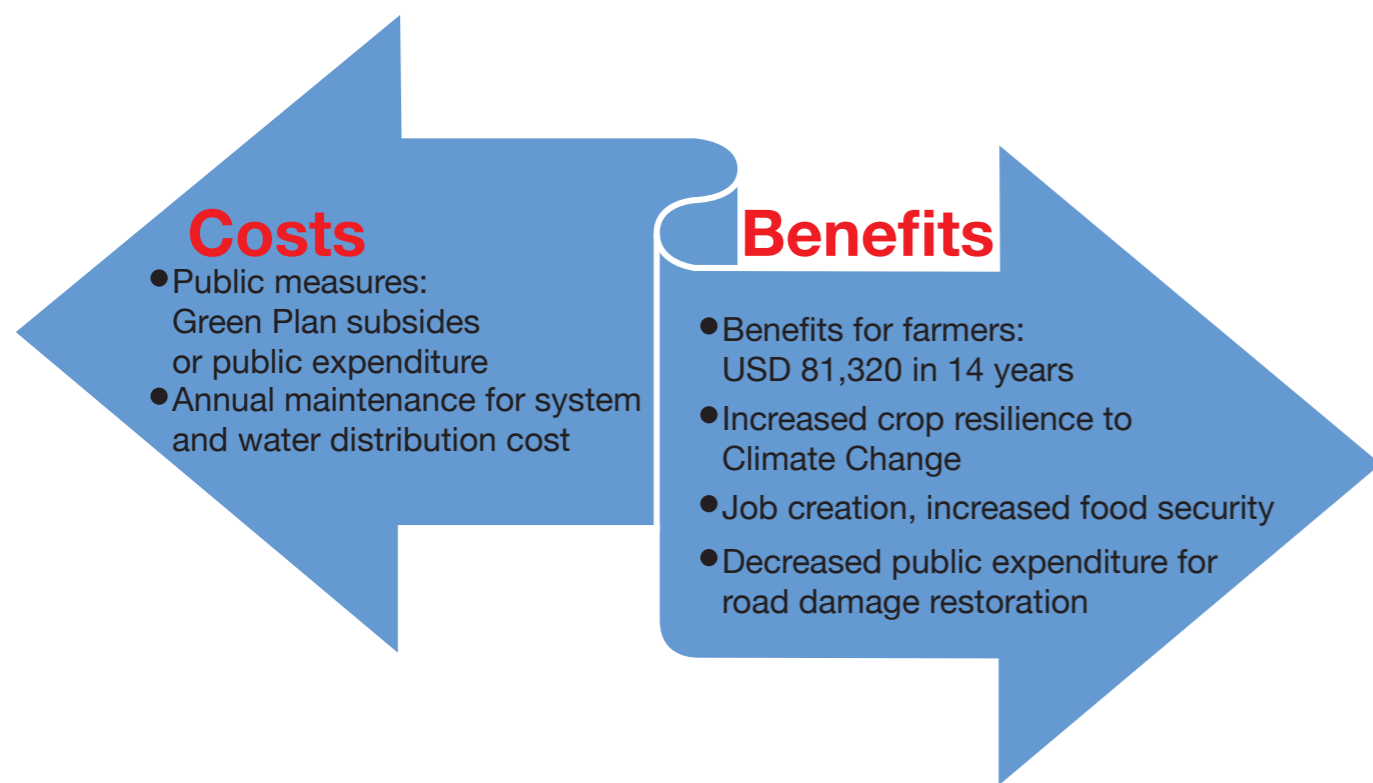


Fig. 71 - Cost and benefits of transfer and diffusion of RWHR

Source: Author's own design

Table 81 - Technology Action plan for Rainwater Harvesting from Roads

Measures	Priority	Objective	Responsible parties	Beneficiaries	Time scale	Monitoring & Evaluation indicators	Estimated cost (USD)	Donors
Training of technicians at the order of engineers	1	To be able to adapt road design for RWHR.	National experts	Green Plan; CDR; MoPWT; DGUP; Orders of engineers	Short term	Number of trained technicians able to create new road designs.	2,000 to train 10 technicians	World Bank Adaptation Fund GEF IFAD FAO Islamic Bank EU USAID Kuwaiti Fund Italian, Spanish Cooperation
Elaboration of adapted tender documents control construction works	3	To be able to control public works according to set standards and design.	CDR, MoPWT, Green Plan, Municipalities	Public, farmers, municipalities, Government	Medium term	Number of roads according to preset design.	0	
Awareness raising through Seminars, bi-lateral meetings, TV program	1	To better understand the impact of rainwater and flood risk, drainage, and the importance of RWHR and to avoid market failure and enhance RWHR from existing and planned roads.	Trained technicians, media	CDR; Municipalities; MoPWT; DGUP; public work contractors	Long term	Number of demands for roads with infrastructure for RWHR and drainage in municipalities, and demands for urban planning and zoning.	3,000 for 3 seminars and a TV program	

Measures	Priority	Objective	Responsible parties	Beneficiaries	Time scale	Monitoring & Evaluation indicators	Estimated cost (USD)	Donors
Elaborating terms of references with technical specifications for new road designs.	2	To set standards for road design, in order to enable RWHR and reduce floods in urban areas.	CDR; MoPWT; Green Plan and Municipalities	Public, farmers, municipalities, Government	Medium term	Tender dossier and technical specifications elaborated.	0	
Conducting arrangements for budget allocation and creation of a financial mechanism	2	To ensure the extra funds for achieving the required infrastructure and land acquisition for water storage and to maintain the system.	Government, MoF, MoIM, CDR; national financial expert	MoPWT, Municipalities, Green Plan	Long term	Budget allocation for RWHR within the annual budget of the beneficiaries.	5,000 for the charges of the financial expert	
Re-considering urban planning and land zoning upon request of municipalities	3	To overcome the limited availability of land for water storage and ensure the sustainability of agriculture land benefiting from RWHR.	DGUP	Municipalities, farmers	Long term	Number of municipalities having land use zoning and urban plans.	0	

## 7.6 Analysis of Technology: Water Users Association (WUA)

### 7.6.1 Brief description of the technology

A Water User Association is an organization for water management made up of a group of small and large-scale water users, such as irrigators, who pool their financial, technical, material, and human resources for operation and maintenance of a local water system, such as a river or water basin. The association plays a key role in integrated approaches to water management that seek to establish a decentralized, participatory, multi-sectorial and multi-disciplinary governance structure.

The objectives of a WUA commonly include: i) Conservation of water catchments, ii) Sustainable water resource management, iii) Increase availability of water resources and, iv) Increase the usage of the water for economic and social improvements. Its core activity is to operate the waterworks under its responsibility and to monitor the allocation of water among its members. WUA is hence different from the traditional “water committee” that used to manage spontaneously without any institutional or scientific support water distribution in common water sources in villages, and that was prohibited recently by law.

### 7.6.2 Identification of Barriers for Water Users Association

The key barriers, as illustrated in the problem tree illustrated in Fig. 72, are as follow:

- Difficulties in managing a common water resource: Farmers individualism and the difficult distribution of roles, costs and water amount among users are the main barriers which is behind the failure of the resolved local water committees in some watersheds in Lebanon.
- Limited social acceptance for water pricing: legal pricing is difficult to adopt due to religious tradition imposing water as a free resource for all. The current symbolic water usage fees are not enough for water monitoring, covering the fees of maintenance of the distribution system and monitoring of water flow amongst users.
- Insufficiency in water laws: such as “Water Act” setting the basis of modern WUA, knowing that Law 221 merged all local water

committees under regional committees. One law in 1943 enabled the creation of a “water syndicate” however this law became obsolete with time.

- Limited awareness at social (water users) and decision maker’s level: the social perception is incusted into the old “water committees” and stakeholders are not aware of WUA existence.
- Inherited sharing rights: the “water turn” and share is based on inherited number of hours per week or month, which does not enable irrigation on a daily basis or based on climatic demand.
- Scarce human skills to manage WUA: where the required skilled human resources are limited
- Unsuitable university curricula: the lack of knowledgeable engineers capable of running a WUA is due to the absence of appropriate university curricula for water management
- Absence of institutional support: No clearly defined institutional body organizes WUAs and supervises their work.
- Limited institutional and financial arrangements: for funding irrigation distribution schemes and for implementing a university curriculum on WUA, as well as making the necessary law amendments enabling the creation of WUA.
- Limited enabling structure for water monitoring: water distribution system, pressurized with counters is essential for water flow and distribution monitoring.
- Deficit funds: to establish water distribution networks and monitoring system.
- Low revenues: farmers with their modest income are not able to fund the installation of water distribution networks or to cover upgrade and maintain the existing network.