Technology Fact Sheet for Adaptation

A. Conservation Agriculture (CA)[i]

Sector : Agriculture	
Subsector : rainfed crops and irrigated field crops	
Technology characteristics	
Introduction	Conservation agriculture (CA) is an agriculture system that aims at soil and water conservation. It combines three principles: minimal soil disturbance (no-till practice), permanent soil cover (cover crops, residues and mulches) and crop rotation or crop association. Consequently soil organic matter is conserved and water retention is increased while erosion and pollution are reduced, namely in arid and semi-arid climatic conditions.
Technology characteristics/highlights	- Most CA practices have been historically practiced (soft technologies). - Adapting CA to some crops may require specific machinery for seeding. - CA induces a decrease in machinery use, fuel and time-saving in operations. - CA is suitable for arid and semi arid regions, to areas with soils suffering from low organic matter content and for areas prone to desertification - CA should be avoided in soils with high clay content, in humid areas with shallow water table, in saline soils and for crops with no residues left.
Institutional and organizational requirements	More research and trial should be done in different agriculture zones, namely in arid regions. Capacity building and knowledge transfer is required for the adaptation option to be implemented where CA deployment is successful.
Operation and maintenance	CA requires the use of specific seed machinery for seeding and sufficient large areas to adopt crop rotation (namely for cereals and legumes). To maintain soil fertility agriculture residues should not be removed. Training is required for technicians and furtherer to farmers.
Endorsement by experts	CA is widely acknowledged worldwide. Nevertheless, in Lebanon and other countries, such technology is not endorsed by all experts in the matter. Further investigation might be required.
Adequacy for current climate	No negative consequences are mentioned concerning adopting CA under current or future climate. On the contrary, it is known that CA is adapted to arid and semi-arid conditions and can have a role in reducing GHG emissions.
Scale/Size of beneficiaries group	All farmers growing rainfed or irrigated field crops or even fruit crops in arid and semi-arid zones (i.e. the Bekaa).
Disadvantages	Farmers benefiting from agriculture residues (as forage in mixed farming systems) will not profit from CA, as conventionally, post to harvest, they rent the land for grazing. However, controlling grazing and keeping a part of the residues might be feasible and a good compromise and this issue still under studies within our local conditions.

	Farmers renting properties on a short term basis contract cannot take advantage from CA. Small holders are unable to apply economically viable crop rotations, and unable to access to machinery. In some cases yields might decrease, as well as fruit caliber (i.e. potato).
Capital costs	
Cost to implement adaptation technology	CA has less expenditure in capital cost (for machinery), in labor and energy than conventional agriculture. In field crops, the cost of implementing the technology is reduced to the cost of the seeder or planter (2000$).
Additional cost to implement adaptation technology, compared to "business as usual"	Cost depends on the type of crops. In fruit orchards, the cost is minimal (only cost of green cover seeds). The cost of production is reduced as plowing is not practiced. In field crops, less machinery is involved. When compared to business as usual, there is no additional cost rather than a reduction by 350$/ha at least (cost of land preparation).
Long term cost (i.e. 10, 30, or 50 years) without adaptation	Case of olive: annual plowing will cost 650$/ha Case of cereals (cost of production of a monoculture with till): 1200$/ha
Long term cost (i.e. 10, 30, or 50 years) with adaptation	Case of olive: first year: 160$/ha (green cover seeds and herbicide), then 30$/ha starting the second year. Case of cereals: (barley-vetch rotation with not till): 800$/ha
Development impacts, direct and indirect benefits	
Direct benefits	Long term cost without adaptation will increase as farmers will face an increase in chemical and ever water use to preserve soil fertility and consequently and increase in the cost of production. In CA the cost of production is maintained as the inputs do not augment, as soil fertility and water content are preserved. The major saving will in terms of costs for tillage and land preparation for plantation. Yield variation is not significant, but production is sustained with minimal annual variation (i.e. no biennial variability in olive orchards…).
Reduction of vulnerability to climate change, indirect	Soil is preserved from the impact of climatic adverse (wind, rain, solar radiation) and evaporation is reduced, which increases soil water content and soil organic matter. Better resilience to drought and flash floods.
Economic benefits, indirect Employment Growth & Investment	No specific increase or decrease is expected. Investment in machinery is required.
Social benefits, indirect Income	An overall yield stability, and a reduction in cost of production, farmer's income is hence increased. Better resilience to climate change. In case of cereals, revenue is increased by 760$/ha if we shift from a monoculture of barley with till to a rotation of barley-vetch with no till.
Environmental benefits, indirect	Reduction in GHG emissions as the soil is not disturbed. Less flooding through better water retention and slower run-off. Soil water content increased by 2%-3%. Better nutrient use efficiency, and hence reduction of inputs and pollution. Increased biodiversity in the soil. Reduced

	desertification.
Local context	
Opportunities and Barriers	No institutional or policy barriers exist. Nevertheless, the land tenure system could be sometimes a barrier for applying CA. Opportunities are numerous in terms that CA is not only a technology to cope with climate change, but also a mitigation mean as it reduces GHG emissions due to soil disturbance. CA is also an opportunity to combat desertification and reduce flood risk in northern Bekaa. CA is an opportunity to improve livelihood in arid and semi-arid areas of Lebanon which happen to be among the poorest regions.
Market potential	CA is a non-market technology by itself. However crops issued from CA will be more environmental friendly and with lesser pesticide residues. Such traits would give them a higher competitive potential on the market.
Status	CA in Lebanon is still at its early stages, in experimental plots in semi-arid areas (ACSAD/GIZ/AUB/ICARDA). Experiences should be widened to different agro-climatic zones as well as to different agriculture systems (orchards, small holders, mixed farming…). Cultivated area under CA: 150-1000ha.
Timeframe	Medium to Long Term
Acceptability to local stakeholders	CA is hindered by economical and social constraints: small holdings, and the inherited ideas on tillage which would be difficult to change.

[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/**