Technology Fact Sheet for Adaptation

Appropriate Varietal development [i]

1. *Sector:*	Food
2. Technology Characteristics:	Adaptation
2.1Technology Name:	1. Appropriate Varietal development
2.2 Introduction: *low/high tech.* *Brief introduction to the technology*	The development of new varieties is a technology aimed at building resistance to diseases, pest organisms and environmental stresses accentuated by climate change, thereby enhancing productivity of crops and quality, health and nutritional value of crops. The development of modern varieties is carried out by Plant Breeders in the Agricultural Research organizations in state & private companies and help selecting, recommending and introducing varieties better adapted to local climatic conditions. Although there are thousands of traditional and modern high-yielding varieties of crops in existence only a small number of these are multiplied and distributed by the seed producing agencies, whereas famers themselves continue to produce and exchange other varieties preferred by them due to their abilities to adapt to climatic conditions, quality or other reasons. These lesser-used varieties serve as a gene pool to develop new varieties with the characteristics that show better adaptation. Biotechnology offers a more direct approach to breed varieties to tolerate stress by utilizing the gene technological processes to directly detect and transfer genes of interest from other plant or organisms into the crop of interest. By allowing transfer of genes of interest across crops or species that do not normally breed (genetically modified), biotechnology greatly enhances the breeder's ability to produce new varieties with desired characteristics. However, genetic modifications involving complex, multiple gene transfers required for producing tolerance to stresses caused by climate change impacts would still be a challenging task.

2.3 Technology Characteristics/Highlights: *Few bullet points, ie. low/high cost; advance technology; low technology.*	• Requires advance technology (genome mapping, marker development) • High cost intervention (Manages large amounts of experiments and time consuming) • Hard technology due to heavy dependence on equipment, tools and laboratory and other structures • Requires more collaboration and technical assistance from advanced countries with highly-developed systems of scientific research • Even with genetic modification, breeding for tolerance for climate change impacts such as flood/drought resistance, salinity tolerance will require longer term investments in research
2.4 Institutional and Organizational Requirements: *How much additional capacity building and knowledge transfer is required for the adaptation option to be implemented.*	Capacity building is required both at the institutional level, i.e. for increasing research capability, and the organizational level, i.e. for extension of research findings. International collaboration and technical assistance from more advanced systems of research and development outside the country will be necessary. Also, much of the resident capacity for genetic modification lies with multinational companies and commercial research organizations.
3. Operations and maintenance	
3.1 Endorsement by Experts:	Selecting cultivars with traits appropriate for different climatic and environmental conditions has always been the basic process of identifying new varieties. Breeding has tremendously expanded the scope of producing new varieties by facilitating to move beyond the existing genetic pool. Biotechnology and genetic engineering permits making even more dramatic and rapid changes in the breeding process. Varietal development reinforced by advances in biotechnology would be the most potent technology for strengthening adaptation to emerging climate change impacts.
3.2 Adequacy for current climate: *Are there negative consequences of the adaptation option in the current climate? Some adaptation may be*	The development of new cultivars of crops or breeds of animals that are highly adapted to specific conditions at different locations is an approach that is followed by breeders to increase productivity even at present. The

targeted at the future climate but may have costs and consequences under the current climate.	specific conditions that define local conditions are combinations of natural and biological factors determined by the local microclimate. In general breeding for such high levels of specificity and the management of such processes is complex and expensive process. But climate change makes breeding varieties with higher abilities to tolerate extreme, hostile environments even more justifiable.
3.3 Size of beneficiaries group: *Technology that provides small benefits to larger number of people will often be favored over those that provide larger benefits, but to fewer people.*	Varietal development is important to protect the ability of current production systems to provide food supplies for everyone. If food supplies are threatened, prices will rise affecting food security of large segments of poor populations.
4. *Costs*	
4.1 Cost to implement adaptation options: *Cost measures*	Rs. 30 million per variety developed using the biotechnological techniques of breeding.
4.2 Additional costs to implement adaptation option, compared to "business as usual":	Molecular breeding so far has not been proven to be either faster or cheaper than conventional breeding although the incremental knowledge gained is expected increase productivity of it over time. Rapid pace of changes occurring due to climate change will require increasing the current level of effort three-folds (300%) to sustain innovation required to stay abreast with change. Therefore, additional costs can be roughly estimated to be double what is spent at present on varietal development programs.
5. *Development Impacts, indirect benefits*	
5.1 Economic benefits: **Employment -** *Jobs* **Investment -** *Capital requirements*	- Ensured food security - Increased productivity and profitability - Increased employment opportunities
5.2 Social benefits: **Income -** *Income generation and distribution* **Education -** *Time available for education* **Health -** *Number of people with different diseases.*	- Reduced rural poverty. - Helped rural development - Improved livelihood of the farmers

5.3 Environmental benefits: *Reductions in GHG emissions, Local pollutants, Ecosystem degradation etc*	- Reduced environmental damage by avoiding pest control chemicals - Secure bio diversity
6. *Local context*	
6.1 Opportunities and Barriers: *Barriers to implementation and issues such as the need to adjust other policies.*	None.
6.2 Status: *Status of technology in the country*	Sri Lanka has developed technologies for varietal development over a long period and the capacity to achieve breakthroughs is very high.
6.3 Timeframe: *Specify timeframe for implementation.*	Ten to 15 years.
6.4 Acceptability to local stakeholders: *Whether the technology will be attractive to stakeholders*	The technology is highly acceptable as seen by the adoption rates for new varieties of crops.

[i] **This fact sheet has been extracted from TNA Report – Technology Needs Assessment Reports For Climate Change Adaptation – Sir Lanka. You can access the complete report from the TNA project website http://tech-action.org/**