```

**Annex 4: Agriculture Sector Fact Sheet – Sprinkler Irrigation**

| | |
|---|---|
| **Sector** | Agriculture |
| **Category** | Infrastructure installation |
| **Adaptation needs** | More efficient use of water supply during periods of drought and for normal supply of water. |
| **Technology Name** | Sprinkler Irrigation |
| **How this technology contributes to adaptation** | Sprinkler irrigation technology can support farmers to adapt to climate change by making more efficient use of their water supply. This is particularly appropriate where there is (or is expected to be) limited or irregular water supply for agricultural use. The sprinkler technology uses less water than irrigation by gravity, and provides a more even application of water to the cultivated plot. |
```

```

| | |
|---|---|
| **Background/Notes, Short description of the technology option sourced from ClimateTechWiki, Seminars, etc** | Sprinkler irrigation is a type of pressurized irrigation that consists of applying water to the soil surface using mechanical and hydraulic devices that simulate natural rainfall. These devices replenish the water consumed by crops or provide water required for softening the soil to make it workable for agricultural activities. The goal of irrigation is to supply each plant with just the right amount of water it needs. Sprinkler irrigation is a method by which water is distributed from overhead by high-pressure sprinklers, sprays or guns mounted on risers or moving platforms. Today a variety of sprinkler systems ranging from simple hand-move to large self-propelled systems are used worldwide. Global use of sprinkler irrigation is: the Americas (13.3 million hectares (Mha)), Europe (10.1 Mha), Asia (6.8 Mha), Africa (1.9 Mha), and Oceania (0.9 Mha) (Kulkarni et al, 2006).<br>A sprinkler irrigation system typically consists of:<br>i) A pump unit which takes water from the source and provides pressure for delivery into the pipe system. The pump must be set to supply water at an adequate pressure so that the water is applied at a rate and volume adequate to the crop and soil types<br>ii) Main pipes and secondary pipes which deliver water from the pump to the laterals. In some cases these pipelines are permanently installed on the soil surface or buried below ground. In other cases they are temporary, and can be moved from field to field. The main pipe materials used include asbestos cement, plastic or aluminum alloy<br>iii) The laterals deliver water from the pipes to the sprinklers. They can be permanent but more often they are portable and made of aluminum alloy or plastic so that they can be moved easily<br>iv) Sprinklers, the water-emitting devices which convert the water jet into droplets. The distribution of sprinklers should be arranged so as to wet the soil surface in the plot as evenly as possible.<br>A wide range of sprinkler systems is available for small and large-scale application. Set systems operate with sprinklers in a fixed position. These sprinklers can be moved to water different areas of the field, either by hand or with machinery. Hand-move systems are more labor intensive and may be more suited where labor is available and cheap. On the other hand, mechanically operated systems require a greater capital investment in equipment. Mobile systems minimize labor inputs by operating with motorized laterals or sprinklers, which irrigate and move continuously at the same time (Savva and Frenken, 2002).<br>Sprinkler irrigation efficiency is highly dependent on climatic conditions. FAO (1982) proposed the figures of farm irrigation efficiencies provided in Table 1 on the basis of climate. Table 1: Farm irrigation efficiencies for Sprinkler Irrigation in different climates |

| Climate/Temperature | Farm irrigation efficiency |
|---|---|
| Cool | 0.80 |
| Moderate | 0.75 |
| Hot | 0.70 |
| Desert | 0.65 |
```

```

| | |
|---|---|
| **Implementation assumptions, How the technology will be implemented and diffused across the subsector?** | When planning to install a sprinkler irrigation system, information should be obtained regarding the following key factors:<br>• The crop or crops to be cultivated and their water requirements throughout the growing season<br>• The shape and size of the field. This will determine the range of suitable technologies, investment and labor requirements<br>• Topography, in particular the location and elevation of the water source relative to the field, land slopes and uniformity<br>• The source of irrigation water can be surface water, groundwater or non-conventional water (such as desalinated water and treated wastewater) (Savva and Frenken, 2002). Water must be available in sufficient quantity from a locally accessible source. A clean supply of water free of sediment is required to avoid blockage in sprinkler nozzles and crop spoilage (FAO, 1988)<br>• Available labor force (According to the Statistical Institute of Belize in September of 2013 there were 21,699 person employed in the agriculture industry). Where skilled laborers are not available on location, local farmers will require training to install, maintain and repair the various components of the sprinkler system<br>• The soil profile. Sprinkler irrigation technology is best suited to soils with high infiltration rates so that ponding and surface runoff can be avoided.<br>• Energy requirements of different systems, including the manufacturing, transportation and installation of the various systems. The location of the water source will also affect the need for energy for pumping (Savva and Frenken, 2002)<br>• Social aspects such as local preferences, capacity to maintain the system, implications for labor requirements and how these may affect different members of the community (Savva and Frenken, 2002)<br>• An understanding of existing health risks is crucial to avoid schemes that may promote water borne diseases (Savva and Frenken, 2002)<br>• An environmental impact assessment should be conducted to fully understand potential impacts of drainage and diverting water resources, amongst others (Savva and Frenken, 2002).<br>Maintenance of the system mainly relates to regular cleaning of the component parts. Seals on pipes and sprinkler nozzles should be checked to avoid water seepage. During periods when the equipment is not being used, it is recommended to store component parts in a cool, dark place. According to Savva and Frenken (2002), a whole range of institutional conditions must be understood before sprinkler irrigation technology selection can be made. These include land tenure issues, water rights, and financial incentives by government and taxation. Large-scale irrigation schemes will usually form part of national policy and could be harnessed to support national employment initiatives. Where the sprinkler irrigation type is not available nationally, foreign imports or government-supported stimulation of national manufacture will be required alongside investment in training for design, installation and maintenance. Coordination with public or private authorities in charge of water management will be crucial and could be facilitated through the establishment of a committee of |


```

```

| | |
|---|---|
| **Costs** | The cost of installing a sprinkler system suitable for a family production unit ranges from US$ 600 to US$ 2500 per hectare (The cost of a sprinkler system for an average size farm is about US$50,000), depending on the type of materials used and the amount of labor contributed by rural producers. Affordable Micro Irrigation Technologies (AMITs) are low cost and low pressure systems with the same technical advantages as conventional micro-irrigation system, however the technology is packaged and marketed as kits suitable for small fields (25 $m^2$ to 4000 $m^2$). The AMIT has the specific advantage of being affordable, and easy to understand; they also have rapid pay back, divisibility and expandability. Mechanically operated sprinkler systems which are used by large scale farmers require a greater capital investment in equipment (These are |
| **Country social development priorities** | • Growth and Sustainable Development Strategy for Belize, 2015 (Draft). One of the Actions proposed under this strategy is to increase drainage and irrigation infrastructure for farming and other use, and support this infrastructure with the necessary information tools.<br>This Action builds on the work currently being undertaken to prepare an irrigation master plan and a corresponding investment master plan.<br><br>Application of sprinkler irrigation will comply with this strategy. |
| **Country economic development priorities – economic benefits** | • National Food and Agricultural Policy 2002 -2030<br>The National Food and Agricultural Policy was formulated to address the constraints and challenges affecting the agriculture and food sector. Such constraints/challenges facing the sector included lack of organized marketing, low yields in small-scale agriculture, lack of drainage /irrigation, limited research/development, outdated farming practices/equipment, etc.<br><br>This technology addresses irrigation which would also affected yields. |
| **Country environmental development priorities --environmental benefits** | • Belize's National Environment Action Plan – 2015-2020<br>Conservation of natural resources, minimizing environmental pollution and depending on crop rotation, decreasing insect pests, diseases and weed problems. This strategy deals sets the stage for conservation of natural resources, water, to address competing uses and projected shortage due to climate change. |
| **Social benefits** | Can improve water efficiency and contribute substantially to improved food production. This technology contributes to food security. |
| **Other considerations and priorities(such as market potential)** | Sprinkler irrigation can be applied to individual small farmers (subsistence) as well as large (commercial and industrial scale) farmers.<br><br>Sprinkler irrigation applies water more efficiently than drip irrigation. |
| **Capital costs (per facility)** | US$ 600 to US$ 2500 per hectare The cost of a sprinkler system for an average size farm is about US$50,000. This is estimated for an average sized farm (in Belize) of 20 ha (approximately 50 ac). |
```

```

| | |
|---|---|
| **Operational and Maintenance costs (per facility)** | Moderate. Most systems use pumps (motorized) to provide the pressure. More expensive systems use mechanical means to move the sprinklers to different positions, while some use man power to relocate the sprinklers as needed. The general cost of operating a sprinkler system is about US$5,000 and maintaining the sprinkler irrigation system is also about US$ 5,000. |
| **Daily supply capacity per facility** | This depends on the design of the system, since delivery of water depends on the needs of the farmer; i.e. hundreds or thousands of gallons per day. The technology is packaged and marketed as kits suitable for small fields (25 $m^2$ to 4000 $m^2$). |
| **Up scaling potential** | Moderate. Easy to apply. Sprinkler irrigation systems can easily expanded to cover larger areas, since networks can be installed. The returns are quick in terms of reduced crop losses. |
```