1.4 Project Idea for Technology 3 - Crop Diversification & Precision Farming (CD&PF)

Crop Diversification and Precision Farming in Dry Zone of Sri Lanka for Managing Climate Change Vulnerabilities, Livelihood Sustainability and Food Security

1.4.1 Introduction/Background

Agriculture is the main source of livelihood for more than 70% of the population living in rural areas of the country. Contributing 11.2% to the country's GDP, accounting for 17 % of all export revenue, employing 30% of the total workforce, and supporting 21 million people directly or indirectly, food sector is vital to Sri Lanka's economy and the livelihood of its people[8]. In Sri Lanka, the contribution to the GDP comes from agriculture, predominantly from crop production which accounted for 79% of the 11.2% GDP share in 2011. In comparison, the respective contributions from livestock, and fisheries sectors were 14% and 7%.
The Government of Sri Lanka has placed high priority on achieving self-sufficiency in rice, the staple food. The country has made significant progress towards this goal by increasing domestic rice production. Irrigated areas in the dry zone are the most important source of increase in production. However, this has not necessarily assured food security as rainfall variations have failed to guarantee an adequate stock of water in certain crop seasons to irrigate all the area planted to rice. This requires building system flexibility to be adaptable to change cropping patterns to suit water availability.

Also, attaining food security extends well beyond increasing rice supply. With urbanization and income growth food consumption patterns are shifting from cereal from non-cereal food (pulses, edible oil, fruits, vegetables, dairy and other livestock, and fishery products). Therefore, supply of these commodities which are currently in short supply also helps to address food security and nutritional goals.
Fortunes of the agriculture sector are also tied up with the success of poverty alleviation in Sri Lanka, which remains predominantly a rural phenomenon in regions dominated by agriculture. Majority of the poor are relying on agriculture for an income the level of which cannot be significantly increased due to the small size of the agricultural holding. This requires farmers to look for more remunerative crops other than rice, which can bring a greater income. Crop diversification to introduce in to the crop mix of the farmer more cash crops, for which there is an increasing demand from the consumer, is one option available to increase incomes above poverty levels.

Agricultural production is adversely affected by climate change and the livelihoods of those depend on agriculture will be at risk from it. CC related impacts on food supply will affect food security of even greater number of people. Arable land area is becoming scarcer making it even more difficult to provide adequate

[8] Central Bank of Sri Lanka, 2011

food production for the nation and incomes opportunities for farmers. This has compelled to look for ways of increasing production and incomes from a diminishing natural resource base.

Potential negative consequences from climate change on agricultural production have generated a desire to build resilience into agricultural systems while moving towards goals of food and nutritional security and poverty alleviation. Increased agricultural diversification and precision farming provides a means to achieve both within agriculture, while other options outside agriculture are pursued.

1.4.2 Objectives

The proposed project will aim to convert about half of the available land, i.e. 40,000 ha of the marginal rice lands and 50,000 ha of the area facing water shortage, to other food crop cultivation including both seasonal crops and perennials. The diversified area will also include crops adopting precision farming techniques such as drip irrigation, micro-sprinklers, and other automated systems for the cultivation of high-value crops.

1.4.3 Outputs of the Proposed Project

The outputs of the project will be delivered in the form of commodities, i.e. intermediate goods such as crop varieties and final goods such as crop production, and services such as improved policy, better market data and enhanced coordination. The key outputs are listed below under main types of interventions:

a. Increased Production of Diversified Crop and Livestock products:

- New varieties of crops and cultivation practices- Four drought and flood resistant varieties and four management packages
- New animal breeds and management packages- Two temperature resistant breeds and management packages accordingly
- Irrigation network restructured to favor diversified crops- Irrigation net work restructured to prepare 9000 ha per year for crop diversification and precision farming techniques
- Post harvest and processing infrastructure installed-
  Develop 10 appropriate cold chain and cold storage facilities for 500 mt capacity
  Develop food processing and post harvest technologi es support product promotion
  Establish storage facilities for 30,000 mt of Onion/Grains

b. Institutional Reform:

- Procedures to reduce fragmentation of land holdings- New land titling and tenancy legislation introduce within 5 years to favour land consolidation
- Improved marketing system with increase integration of rural markets- Introduce at 10 locations
- Market information system providing timely and accurate data

c. Improved Policy Coordination:

- Diversification friendly Land tenancy procedures
- More predictable import policy

1.4.4 Relationship to the Country's Sustainable Development Priorities

Increasing domestic food production to achieve high levels of self sufficiency in major food commodities demanded by the consumer is the key strategy adopted by the government. The "Mahinda Chinthana – Vision for the New Future", the Government of Sri Lanka's Ten Year Development Policy Framework assigns very high priority to domestic production as a means of improving national food security.

Number of programmes have been introduced and operated by the Government over the last 6 years to achieve food security through self sufficiency. The "*Api Wawamu, Rata Nagamu* – Let us Cultivate and Uplift the Nation, 2007-2010" was the apex of these efforts with the domestic production accelerated

ahead of the world food crisis of 2008. This has been followed up with the introduction of new initiatives such as "*Divi Neguma",* a special home gardening program. These special programs aim to increase household food production through the distribution of high yielding seeds, training, technical assistance and credit. *Divi Neguma* aims to strengthen economic status of households and food security by minimizing their dependence on the market for food.

1.4.5 Project Deliverables

The benefits of the project will accrue to all citizens in the forms of increased availability of domestic food products at reasonable prices. As the actual extent of different types of crops planted and dairy production undertaken will depend on the market situation it is difficult to quantify production by individual commodity.

Crop and Livestock products:
Increased production of other food crops – Onion, Chilli, Pulses, Feed crops
Animal Products – Milk and milk products, poultry and goat
Processed food products – Ready-to-eat and other value added food

Services:
Fragmentation of land holdings prevented
Improved marketing system
Rural markets better integrated to Regional and Central markets
Improved Market information system
Modified land tenancy procedures
More predictable import policy

The main beneficiaries: The main beneficiaries of the project are farmers in the dry zone whose livelihoods face climate risk in addition to generally depressing economic conditions that has driven many of them to poverty. The low output and volatile market prices was making it quite challenging to lift out of poverty those depend on agriculture-based livelihoods for a major income. The unpredictable weather conditions were making it even more difficult. The Government was resorting to various forms border protection measures to safeguard incomes of domestic producers thus driving prices up, making consumers pay more. Therefore, domestic production bolstered by increased productivity should make prices more affordable to the consumer while guaranteeing a remunerative price to the producer.

The environmental benefits: The environmental benefits of the project will be quite significant as the technologies would permit efficient crop production in areas that may be abandoned in the absence of new technologies raising productivity. The net effect on GHG emissions, contribution to atmospheric warming and increasing system resilience will have favourable environment outcomes.

Employment opportunities: Increased production and value addition through post harvest will expand employment opportunities thus making more remunerative employment available to women and youth. The precision agriculture methods using developments in the high tech agriculture will make appeal to the educated youth encouraging them to engage in agricultural vocations. More youth will also find employment in the service sector, supplying, operating and maintaining farm equipments employing new technology.

Development of partnerships: Precision farming employs new developments in technology that makes it more appealing for the private sector to engage. Most of these innovations reach the market as proprietary products. Thus, the private firms will be keen to support new high-tech crop and livestock research and develop partnerships with significant new funding.

1.4.6 Project Scope and Possible Implementation

Given agriculture's importance in creating rural livelihoods and reducing poverty, the project has widespread national implications. The reduction in rural poverty can reduce pressure for expansion of agriculture into more marginal lands, where such expansion is led by poor or landless migrants. Other strategies of rural poverty alleviation can reduce those types of land degradation that are due to inadequate investment resources or to unsustainable survival strategies of the poor during droughts or other economic downturns. Finally, rural economic diversification can provide alternative livelihood sources, reducing dependence on marginal farmlands or generating resources for investment in land improvements or both.

The sustainability of the project is rated high as it concurrently addresses two key issues; the low income problem in farming adapting to climate change. Also, the project has immediate application to the area facing identical challenges but does not become a part of the project. Therefore, the scaling up potential can be rated high.

1.4.7 Project activities

The main activities of the project comprise of the following:

1. Develop and introduce new varieties of crops and cultivation practices
2. Develop and introduce new animal breeds and management packages
3. Restructuring of irrigation network to favor diversified crops
4. Develop/Improve post harvest and processing infrastructure
5. Modify the legal framework to favour land consolidation
6. Improve marketing system with increase integration of rural markets
7. Develop marketing information and price reporting system

8. Introduce and implement diversification-friendly land tenancy procedures
9. Introduce more predictable import policy

1.4.8 Timelines for the Proposed Activities

The proposed timeline for implementation of proposed activities are provided in table 1.6.

Table 1.6: Proposed Timelines for Implementation of Proposed Activities of Project 3

Activities	Year									
	1	2	3	4	5	6	7	8	9	10
1.New varieties of crops and cultivation practices										
2.New animal breeds and management packages										
3. Restructuring of irrigation network to favor diversified crops										
4.Develop/Improve post harvest and processing infrastructure										
5.Amend the legal framework to reduce fragmentation of land holdings										
6.Improved marketing system with increase integration of rural markets										
7.Market information system providing timely and accurate data										
8.Diversification-friendly Land tenancy procedures										
9.Introduction of more predictable import policy										

1.4.9 Budget/Resource requirements

The project will have a budget of US $ 60 million and will be operated over a 10-year period. The project can get off to a fast start as there already are many technologies that can be introduced quickly. It will make available a variety of financing mechanisms to introduce the new Precision Agriculture technologies to a large group of beneficiaries quickly.

Given the scale of the project it will be necessary for the Government to obtain development assistance as grants or loans to implement the project. The approximate budget estimate of the proposed project is given in table 1.7 below;

Table 1.7: Approximate Budget Estimate for the Proposed Project 3

Main Activitiy	Sub Activities	Estimated Budget (US $ million)
1. **Increased Production of Diversified Crop and Livestock product**	New varieties of crops and cultivation practices	7.00
	New animal breeds and management packages	5.00
	Irrigation network restructured to favor diversified crops	10.00
	Post harvest and processing infrastructure installed	8.00
	Total	**30.00**
2. **Institutional Reform**	Procedures to reduce fragmentation of land holdings	0.50
	Improved marketing system with increase integration of rural markets	10.00
	Market information system providing timely and accurate data	3.50
	Total	**14.00**
3. **Improve Policy Coordination**	Diversification friendly Land tenancy procedures	8.00
	More predictable import policy	2.00
	Total	**10.00**
2. Project Management		6.00
Total Cost		**60.00**

1.4.10 Measurement/Evaluation

The project design will follow a Results-Based-Management framework developing a Logic Framework Matrix (LFM) and a Performance Measurement Framework (PMF) that internalizes tracking implementation progress and monitoring. Such an arrangement will permit identifying problems and undertaking necessary on-course corrections to remedy any problems. The monitoring framework will involve internal monitoring (quarterly) as well as periodic external evaluations (annually or bi-annually) to support the implementation process.

1.4.11 Possible Complications/Challenges

There are areas that may raise challenges to the implementation of the crop diversification and precision farming project. One potential complication is in getting the policies reformed, which is usually an area that see a lot of institutional resistance. The other relate to timely supply of inputs, particularly seed and planting material.

Policy reform: The project proposal envisages reform in institutional arrangements relating to irrigated cropping patterns, trade and marketing and land tenancy that require broad reform in agency policies and practices in these areas. It is very likely that reaching agreement to implement some of these changes will be a difficult task as changing practices held for long years would be resisted. For example land tenancy legislation is archaic to serve purposes of today's agriculture, but held sacrosanct by some elements, who are motivated more by emotions than reality. Similarly, restructuring of the irrigation water delivery systems for greater flexibility requires innovation and boldness that is not witnessed in bureaucracies.

Availability of adequate suitable Seeds and planting materials: Being able to implement the crop diversification assumes availability of a wide range of seeds for the farmer. In the absence of a market-driven seed supply system in the country it is difficult to expect that seed supplies would be met by the market. This requires the project to undertake the responsibility of ensuring supply quality seed of varieties required. This can be a challenge as seed producers may demand numerous guarantees to make the seed available for the initiatives promoted by the project.

1.4.12 Responsibilities and Coordination

The **implementing agency would be the Ministry of Irrigation** as much of the land will be directly under the command of the Ministry. However, the implementation of the project requires close support and collaboration with the Agriculture and Agrarian Development Ministries. A Project **Steering Committee** arrangement with the Secretaries of the 3 Ministries alternatively chairing the PSC would be helpful to ensure ownership and follow up. A **Project Management Committee** involving staff more closely involved with supervising project implementation and monitoring can provide the necessary guidance and troubleshooting.

The responsible agencies will comprise of the following:

1. Ministry of Agriculture
2. Ministry of Agrarian Development
3. Ministry of Fisheries and Aquatic Resources Development
4. Ministry of Irrigation and Water Resource Management
5. Ministry of Co-operatives & Internal Trade
6. Ministry of Livestock Development

7. Ministry of Land and Land Development
8. Ministry of Traditional Industry & Small Enterprise Development
9. Department of Agriculture
10. Department of Agrarian Development
11. Department of Irrigation

1.4.13 List of References

1. Annual Report. (2011). Central Bank of Sri Lanka, Colombo.