

CASE

Public-private partnership-based municipal solid waste composting (Greenfield Crops, Sri Lanka)

Miriam Otoo, Lesley Hope and Krishna C. Rao



Supporting case for Business Model 10

Location:	Matara, Sri Lanka
Waste input type:	Municipal solid waste (MSW)
Value offer:	Provision of waste management services, and a safe and affordable compost
Organization type:	Public-private partnership
Status of organization:	Established and managed by government from 2005 but entered into a public-private partnership with Greenfields (private company) in 2010
Scale of businesses:	Medium; processes between 300 to 400 tons of MSW per month
Major partners:	Municipal council, Tea Research Institute, Coconut Research Institute, USAID

Executive summary

Greenfield Crops (GC) is a public-private partnership-based (PPP) business which was set up to carry out waste management activities in the Matara municipality. GC adopts an open windrow technology to process municipal solid waste (MSW) into compost. It also produces fuel pellets and sells non-degradable material obtained during the sorting of waste. GC has satellite compost stations which are close to local markets and that provide easy access to waste not requiring significant segregation. Compost is sold directly to farmers through a network of dealers. At the time of this study, the company was not making profits but dependent on government funding. The business is still working to improve their management strategies and the quality of the product to increase its marketability. The compost produced is currently perceived as a soil conditioner by the farmers rather than a fertilizer, and thus to increase its market share GC has to invest in product innovation and new marketing strategies. Activities of the business have improved the local environment and prevented contamination of local water bodies (Nilvala River) as hitherto waste was disposed close to a water body.

KEY PERFORMANCE INDICATORS (AS OF 2015)

Land use:	25 ha including landfill area					
Capital investment:	USD 1,536,688					
Labor:	15 unskilled labor and 3–5 skilled labor/management					
O&M cost:	USD 9,220 per month					
Output:	300–400 tons per month					
Potential social and/or environmental impact:	18 jobs created, clean environment at a low cost, production of compost (soil conditioner) and fuel pellets					
Financial viability indicators:	Payback period:	N.A.	Post-tax IRR:	N.A.	Gross margin:	N.A.

Context and background

The Matara composting plant was set up with funds from the “Pillisarū” project, a Government of Sri Lanka initiative under the Central Environment Authority to improve solid waste management in urban centres. It began its operations – handling of MSW in 2005 – but halted operations due to noted sub-optimality in the management and marketing of the entity. In 2010, GC revived the business through a PPP agreement for a period of seven years, with the first two years being probationary. Under this agreement, the private entity (GC) pays a service fee of USD 1,500 per month to the public entity (municipal council) for using the infrastructure (land, composting facility and machines). The municipality in turn pays GC USD 5 per ton of waste disposed as a tipping fee. Forty tons of waste is collected daily by the municipal council in Matara city and delivered to several different processing sites. GC started satellite compost stations closer to local markets to minimize transportation costs both for waste collection for the municipality and distribution of compost product for the business – thus increasing farmer accessibility to the organic fertilizers. Plans are underway to establish two additional satellite stations in the Eastern Province.

Market environment

Compost sales have been noted on average to be very low in Sri Lanka. This has been attributed to the low nutrient content of the product and inadequate marketing strategies. Standard compost products found on the market penetrate less than 3% of the fertilizer market. This represents an opportunity for initiatives such as GC to penetrate the market by producing high quality compost products. Chemical fertilizers are subsidized in Sri Lanka and this may represent significant competition for GC¹. The extensive use and over-application of chemical fertilizers have been detrimental to the soils in the Eastern Province of Sri Lanka so although organic fertilizers may be comparably more expensive, there is a growing demand for them. Soil conditioners are needed to bind the soil particles together and GC’s compost product can fill this gap. In Matara, 40 tons of waste is generated every day, of which about 60% is organic. Proper and safe disposal has been a challenge and this has caused public protests. The need for sustainable waste management alternatives is unquestionable – thus initiatives such as that of GC will continue to be in demand at least for the few next decades.

Macro-economic environment

As noted, in Sri Lanka, chemical fertilizer is subsidized by the government and has a higher nutrient value – thus representing significant market competition for GC. The subsidized price of a 50kg bag of chemical fertilizer is USD 2.75 and the same quantity of Greenfield compost is sold at USD 3.17, which is comparatively more expensive as farmers will require a greater application with compost quantity than with the former. Another important market condition that affects initiatives such as GC is related to access to funding. Local funding agencies are hesitant to provide loans to waste businesses as they

are less cognizant of this business sector and classify it as high risk, and thus this factor represents potential constraints to the development of waste reuse businesses. On the other hand, although international donors are more interested in funding these initiatives, they tend to have a preference for public entities rather than private businesses. New waste reuse businesses will have to take these external market factors into consideration and adopt mitigation measures to ensure their sustainability.

Business model

Figure 122 presents an overview of Greenfield Crops' business model and described from the perspective of the private entity engaged in the public-private partnership. GC is a PPP entity charged with the processing of MSW into organic compost. The organic compost produced is sold in local markets through selected retailers. Plantation farmers such as tea, cinnamon and coconut farmers are the main users of the organic compost produced. Under the PPP, GC is the private entity and the municipal council is the public entity. The composting facility as well as land and other infrastructure were set up by the municipality. GC only manages the business and bears the cost of operations and maintenance. It pays the municipal council for the use of the resources provided, i.e. the composting facility and equipment. The municipal council on the other hand pays GC tipping fees for the disposal and processing of the solid waste. GC also partners with research institutes (Tea Research Institute and Coconut Research Institutes) for product quality analysis and USAID, who provided funds for the establishment of a laboratory. Essential to this model are the satellite compost stations that GC operates. These stations are close to local markets and farmers, resulting in minimizing transportation costs for waste collection for the municipality and distribution of compost product for the business – thus increasing farmer accessibility to the organic fertilizers. GC sells its compost at a flat price exclusive of transportation fee. Traders add on the cost of transportation and sell it at their preferred prices up to a specified limit². A small quantity of recyclables is also sold to recycling units. While this initiative is currently still dependent on government funding, with plans to increase its scale of production via additional satellite stations, full cost-recovery is certainly achievable in the near future. GC's activities have accrued significant benefits to the society including: a) creation of jobs; b) reduced waste management costs; and c) improved environmental health.

Value chain and position

Figure 123 presents an overview of GC's value chain. The initiative receives MSW from the municipal council which pays USD 5/ton as tipping fees for waste disposed and processed. GC, on the other hand, pays the municipal council for use of the composting facility and other infrastructure. Matara municipal council is the sole provider of the MSW and hence has a strong supplier power which would be a major production risk factor for GC. However, given the nature of the PPP agreement, this power cannot be executed by the municipal council and is mandated to deliver the waste to the business. GC partners with the Tea and Coconut Research Institutes for field trials and product quality analysis. Field experiments have shown that there is a tremendous yield increase when GC's compost is used, suggesting a potentially significant demand if farmers do adopt compost use at least as a complementary product. The final compost product is sold directly in the local markets through a network of retailers. GC's key customers are farmers, specifically tea, rubber, coconut, cinnamon and other cash crop farmers. The business entity does not consider the product as an organic compost but rather as a soil conditioner. Since the customers are diverse, buyer power is relatively mitigated. There are no barriers to entry into the composting business, however, the municipal council owns the waste and permission is required and GC currently has the sole agreement with the municipality.

FIGURE 122. GREENFIELD CROPS' BUSINESS MODEL CANVAS

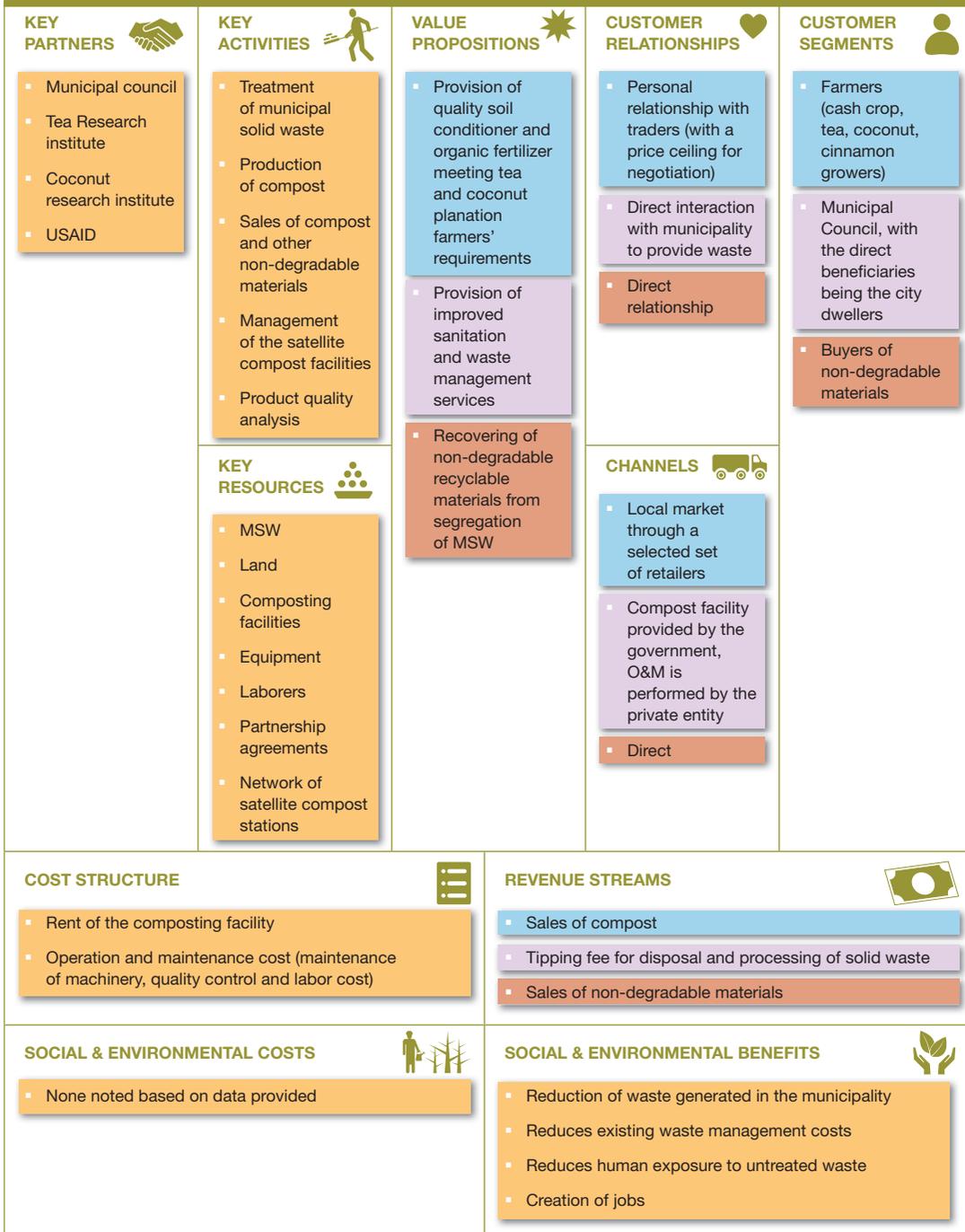
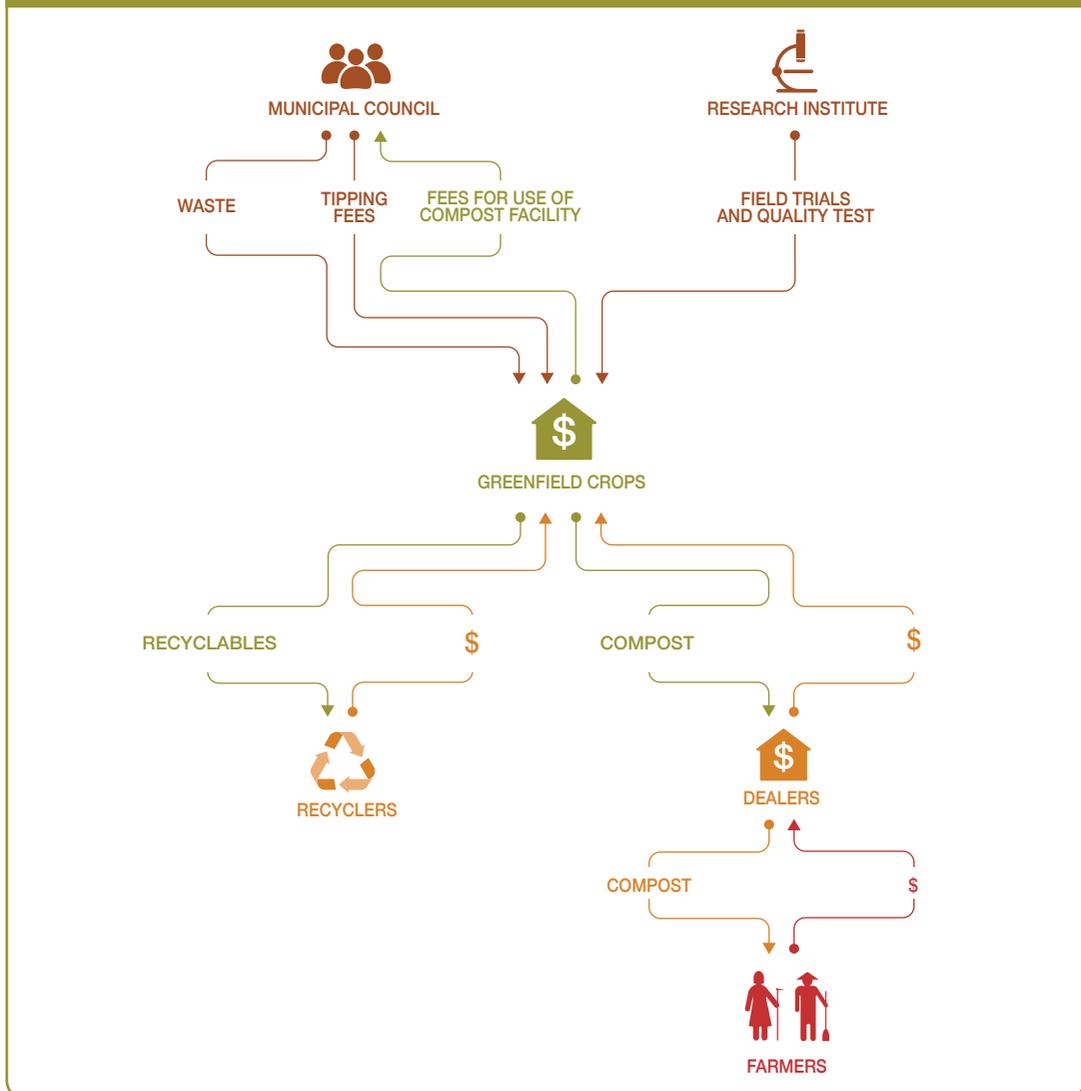


FIGURE 123. GREENFIELD CROPS' VALUE CHAIN



Institutional environment

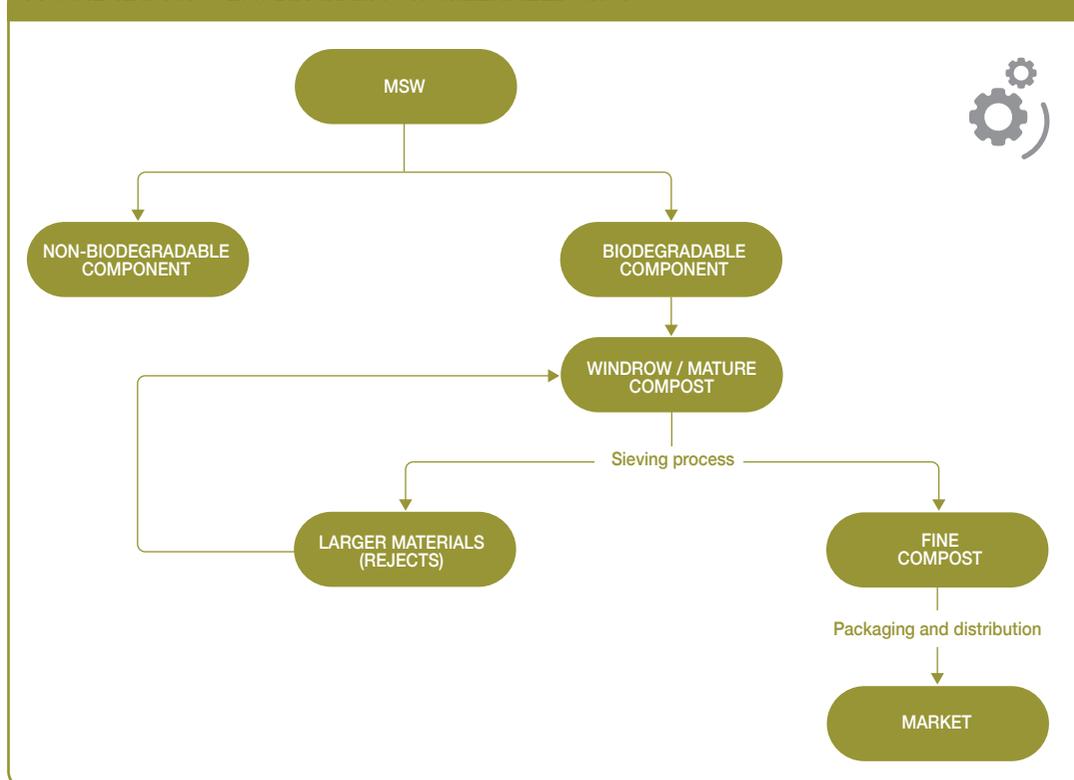
In 2007, the National Policy on Solid Waste Management was formulated that replaced the 2000 National Strategy for Solid Waste Management which targets waste minimization, reuse of waste, recycling and appropriate final disposal of waste. Under the national policy, the government allocates funds for the capital investment of solid waste management projects. While there are so far no laws that prevent the reuse of treated MSW and fecal sludge, all waste reuse businesses in Sri Lanka require permits, certifications and an approved environmental impact assessment prior to starting operations. The Sri Lanka Standards Institution (SLS) is responsible for the development of national standards for products and services used mainly in the industrial and trade sector. SLS has developed standards for the production and marketing of compost and other organic inputs – SLS 1246:2003, UDC628.477.4 (CEA, 2005). This standard requires quality monitoring of the compost product by certified third party

local authority and submission of results to the SLS monitoring committee. Compliance to these standards not only ensures the sustainability of compost businesses but it allows GC to self-brand their product and increase their market share.

Technology and processes

Greenfield Crops uses an open-windrow system for the processing of MSW to compost (Figure 124). The technology is locally manufactured, which reduces the investment cost but also some related maintenance costs as replacement parts can be purchased locally. The MSW is first sorted into degradable and non-degradable fractions. The biodegradable waste is aligned in the windrow where decomposition takes place. Piles are turned once a week to promote aerobic digestion minimizing the odor from decomposition as much as possible. The complete process takes about 45–60 days depending on weather conditions. The duration of each stage also depends on the composition of the waste received. At the end of the composting period, piles are kept for further maturation. The matured waste is then sieved and fibrous materials that degrade slowly are added back to new piles. The sieved material is packaged and sold.

FIGURE 124. PROCESS DIAGRAM FOR GREENFIELD CROPS



Funding and financial outlook

Construction of the composting facility was fully funded by the 'Pillisar' project of the Central Environmental Authority at a cost of USD 1,540,000. GC spends USD 9,240 per month for its operations. The operational cost includes electricity, fuel, worker wages, repair and maintenance and the service

fee. Electricity and fuel cost alone account for 77% of the operation cost. The business generates revenue from sales of compost, non-degradable and tipping fees at a rate of USD 5 per ton of MSW received. The company processes forty tons of waste on a daily basis, amounting to USD 6,000 per month as tipping fees. Monthly sales of compost and non-degradables averages about USD 15,400 and USD 355, respectively. Although representative of 70% of all generated revenue, the enterprise remained unable to sell all of its compost and is working on implementing a new marketing strategy to boost sales and increase its profits.

Socio-economic, health and environmental impact

The PPP has saved the municipal council a significant amount of money which hitherto was used in operating the composting business as it was incurring losses. Additionally, through charges for the use of the composting facility and equipment, it is able to implement a mutual financial sustainability strategy. The activities of GC have rid the municipality of indiscriminate waste disposal while tidying up the city and reducing water pollution. The business has also provided jobs for some low-income earners, but the process of manual sorting, sieving and packaging may present occupational health risks as well if proper mitigation measures are not adhered to.

Scalability and replicability considerations

The key drivers for the success of this business are:

- Given the scale of operations, the PPP arrangement is ideal for this business set-up – public sector constructs the infrastructure and provides the capital cost required for equipment, and private sector brings in sophisticated management and skills to operate the facility.
- Government policy encourages reuse and recycling and sufficient incentives such as tipping fees have been provided to keep the private sector interested in managing the facility.

GC has adopted a system of compost production where compost is produced at vantage points close to local markets. The technology used is simple, and requires limited technological expertise and energy, making it highly replicable. Waste segregation is a primary cost component as well as a major source of inefficiency and thus scaling up may optimise production, as benefits will outweigh costs. A major limitation is the high capital investment requirement for land and especially in localities that are yet to be developed in terms of infrastructure, e.g. roads. This model is highly replicable in large cities with significant waste generation. However, limitations of land availability, competition in the product market and technological adaptations have to be taken into consideration.

Summary assessment – SWOT analysis

The SWOT analysis for GC composting plant is presented in Figure 125. The key strengths of the business are: a) the support from municipal authority, and b) innovative production system of satellite stations which increase its access to the waste source and product markets via reduced transportation costs. A key weakness of the PPP is the high investment requirements for future expansion and the labor-intensiveness of waste segregation. The latter represents a potential risk to the business in the instance where labor wages rise – which would imply the adoption of a new technology or increasing their labor prices to maintain their staff. GC generates a comparably low amount of money from the sales of recyclables. There are opportunities for the business to increase its revenues via value-addition to the plastic materials (via shredding and pelletization) which would command higher prices but also access new markets. Given the success of this public-private partnership, this model could be potentially replicated in other towns and cities in Sri Lanka. Many factors including competition in the fertilizer market, technology adaptation, among others need to be taken into consideration.

FIGURE 125. SWOT ANALYSIS FOR GREENFIELD CROPS

	HELPFUL TO ACHIEVING THE OBJECTIVES	HARMFUL TO ACHIEVING THE OBJECTIVES
INTERNAL ORIGIN ATTRIBUTES OF THE ENTERPRISE	STRENGTHS <ul style="list-style-type: none"> Soil conditioning characteristics with water and nutrient retention capacity of the product Support from municipal authority Compost satellite stations close to waste source and product markets Adequate and continuous supply of waste Limited technological expertise needed 	WEAKNESSES <ul style="list-style-type: none"> High investment requirements Limited access to loan Inadequate marketing strategies Nutrient content of compost is fairly low Technology (sorting) is labor intensive Technology efficiency dependent on weather conditions
EXTERNAL ORIGIN ATTRIBUTES OF THE ENVIRONMENT	OPPORTUNITIES <ul style="list-style-type: none"> Production of fuel pellets from non-degradable and increasing sales of recyclables Replicating similar model for other towns in Sri Lanka Strong potential for tapping carbon market as an additional revenue source given scale of business SLS regulation allows for self-branding upon compliance Government policy allotting funds for solid waste management projects 	THREATS <ul style="list-style-type: none"> High subsidy for chemical fertilizer Increasing labor wages present potential production risk for business

Contributors

Heiko Gebauer, EAWAG, Switzerland

Jasper Buijs, Sustainnovate, Netherlands; formerly IWMI, Sri Lanka

Josiane Nikiema, IWMI, Ghana

References and further readings

CEA. 2005. Technical guidelines on solid waste management in Sri Lanka. Central Environment Authority, Colombo <http://www.cea.lk/web/images/pdf/Guidlines-on-solid-waste-management.pdf> or <http://librepo.cea.lk/bitstream/handle/1/622/08651.pdf?sequence=2&isAllowed=y> (both accessed November 8, 2017).

Personal communication with staff of Greenfield Crops. 2015.

Case descriptions are based on primary and secondary data provided by case operators, insiders or other stakeholders, and reflect our best knowledge at the time of the assessments 2015/16. As business operations are dynamic, data can be subject to change.

Notes

- Fertilizer subsidy scheme (fixed price for Nitrogen (urea), Phosphorus (TSP), Potassium (MOP) at Rs. 350/50kg) in Sri Lanka was changed in 2016 to a cash payment of Rs. 25,000/ha/year for paddy farmers. (USD 1 = approx. Rs 140).
- Price information details were not provided.