

Sidrap Community Reforestation of Unproductive Grassland, Indonesia

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Introduction

Sidenreng Rappang (Sidrap) district is located in South Sulawesi province, about 185 km to the north of Makassar. It covers an area of 1,883 km², or roughly 3% of the total area of South Sulawesi. Sidrap contains 11 subdistricts (*Kecamatans*), 38 subsubdistricts (*Kelurahans*) and 65 villages. Land use in Sidrap is dominated by 37,212 ha of irrigated rice fields, 19,162 ha of pasture, and 15,326 ha coconut plantations. Other land uses/crops include dryland rice (8,987 ha), cacao (6,765 ha), candlenut (6,398 ha), cloves (4,064 ha), cashew (2,304 ha), black pepper (210 ha), coffee (172 ha) and cotton trees (141 ha) (BPS Sidrap 2004). Sidrap is considered a major producer of agricultural commodities. The district is the biggest producer/exporter of rice and exporter of beef/cattle in South Sulawesi. It exports rice to the Middle East and beef/cattle to Jakarta and Kalimantan (BPS Sidrap 2004).

The human population of Sidrap numbers 241,555. The population density is 126 persons/km², and the annual growth rate is 0.25%. The people of Sidrap are diligent and hardworking, and renowned for the local principle *Resopa temmagingi mallomo pammase dewata* ('Only with hard work will blessings from God be obtained'). Most families rely on agriculture as their source of livelihood. The positive macroeconomic conditions of Sidrap overshadow the desperate economic conditions of many of its people. District data indicate that in 2003 65% of the population lived at subsistence or poverty level, and 8% lived below the poverty line (BPS Sidrap 2004).

Sidrap includes 16,000 hectares of grassland (BPS Sidrap 2004), which has become a climax land cover due to its tolerance of wildfires, which occur every 1–2 years. The grasslands are dominated by *Imperata cylindrica*. Most of these lands are found on state lands and are considered unproductive. As in many parts of Indonesia (Tomich *et al.* 1997; Roshetko *et al.* 2002), there is interest at both government and community levels to convert some of these vast grasslands to more productive tree-based systems. To date most reforestation efforts, both public and private, have fallen short of their objectives due to reoccurring fires and a lack of clear land/tree tenure. A local model of successful reforestation does exist, however.

Originally natural lowland forests, grasslands have dominated parts of Sidrap since the late 1960s. In 1967, Haji Abunawas was granted land-use rights to 382 ha of *Imperata* land in recognition of his service to the district by becoming the national Pencak Silat champion¹. Haji Abunawas invited 100 households to share the land grant with him, providing full tenure rights to the land they convert to tree farming systems. The reforestation process is primarily supported by the resources of subsistence households, with occasional support of seedlings or other inputs from periodic government programs. This strategy has successfully reforested 300 ha, at a rate of less than 8 ha/yr. For his innovative tree farming approach and success Haji Abunawas has been honoured with national awards. The district government would like to replicate, expand and accelerate this successful farmer-led strategy as a means to rehabilitate degraded lands and establish economically viable tree production systems. It is willing to provide land/tree tenure and facilitate technical support to communities willing to rehabilitate degraded grasslands with tree-based systems. Communities are interested in this concept as a means of gaining tree and land tenure, diversifying their current farming systems, and establishing market-oriented tree-based systems to enhance their medium- to long-term income. As most households are subsistence farmers, however, they lack the start-up capital required to invest in tree-based systems.

A consortium of local organizations and government agencies is willing to assist local communities. It sees community-based carbon sequestration projects as appropriate mechanisms to accelerate the reforestation of degraded lands and achieve sustainable development by enhancing farmer incomes. In collaboration with Winrock International, the Land Management Grant College (LMGC) of Bogor Agricultural University and the Ministry of Environment and with the support of the Asian Development Bank (ADB) Carbon Sequestration through the CDM for Indonesia ADB TA No. 4137-INO project, the consortium worked with the local communities to design a small-scale afforestation and reforestation Clean Development Mechanism (SS AR CDM) project activity.

The purpose of the project activity is to reforest 650 ha of grasslands with smallholder fruit² and timber systems. Tree species selection was based on community preference and a market orientation. Timber species include both fast- and slow-growing varieties, with rotations of 5–7 years and 30 years, respectively; fruit species

¹ Pencak Silat is a traditional form of martial art.

² 'Fruit species' indicates trees that produce fruits, nuts, spices or other traded commodities.

systems will be retained on farm for 60 or more years after establishment. Project participants (farmers, community organizations and governments) expect project activities to contribute to sustainable development by accruing the following private and public benefits:

- Increase incomes of participating families from (i) market sales of fruit and timber products starting in the fifth year after establishment and (ii) carbon payments from CERs for a 30-year period.
- Rehabilitate 650 ha of grasslands and enhance soil conservation and watershed functions in the greater project area.
- Assist in the development of Sidrap as a major producer of specific tree products.

As of this writing the PDD has been completed, a validation preview has been conducted and the host country approval is in process. This paper documents the key characteristics of and the process used to develop the proposed Sidrap SS AR CDM project activity.

Methods and Approach

Project Conceptualization

The capacity of Sidrap stakeholders to develop and implement an AR CDM project was strengthened through a series of activities summarized below (Winrock and LMGC 2006). As AR CDM projects and related issues are new concepts different from other reforestation and community development project, this series of capacity building activities was designed to be parallel and reiterative to assure stakeholders developed a sufficient minimal understanding.

- National Workshop on Capacity Building for Developing Project Design Document for AR CDM held 1–3 February 2005 to (i) provide an update on CDM and (ii) increase stakeholders capacity to develop AR CDM projects and their understanding of the requirements for developing projects as well as the process of getting project approval from CDM national authorities and the CDM executive board.
- National Project Identification Workshop held 28–29 April 2005 to (i) review the CDM project approval and registration processes; (ii) continue capacity building of district stakeholders regarding preparation of AR CDM projects; (iii) enhance local government capacity to facilitate AR CDM projects; and (iv) explain the district selection process for PDD development under the ADB project.
- Field visits to Sidrap held 12–18 July 2005 and 15–20 January 2006 to (i) enable the Winrock-LMGC team to become familiar with the location; (ii) confirm site data required for the PDD; (iii) hold detailed discussions with stakeholders regarding PDD development and AR CDM project implementation; and (iv) develop among stakeholders a mutual understanding and vision of the proposed AR CDM project.

- Training Workshops on AR CDM PDD Development held 20–23 October 2005 to (i) review data for the PDD and (ii) continue to enhance stakeholders' capacity to understand and develop a PDD through a learning-by-doing (writing) process.
- PDD Validation Preview held 7–12 April 2006 to pre-evaluate the Sidrap PDD in preparation of request for host country approval through the Indonesian Designated National Authority and eventual submission to the executive board for validation.

Additionally, Winrock-LMGC team members visited Sidrap or communicated with stakeholders to provide specifically requested assistance.

Stakeholder Process

Through the activities mentioned above the Winrock-LMGC team simultaneously implemented a stakeholder process intended not only to enhance capacity and commitment to the AR CDM project, but most importantly to facilitate full agreement between all stakeholders regarding the specific AR CDM project design and the roles, rights and responsibilities of each stakeholder (Winrock and LMGC 2006). The process was conducted at both the government level and the community level. This dual approach was used not to draw distinction between the government and communities, but to more directly address the concerns of stakeholders. In fact, representatives of both government and community participated in the stakeholder process at both levels. Government agencies were mainly concerned with the policies, procedures and regulations related to AR CDM project activities. The community was focused on AR CDM project design and establishment as well as management and utilization of the resultant tree-based system. Additional priorities for both levels were to identify a government agency to act as the prime mover of project support and the composition of a District CDM Steering Committee to act as a district focal point for all CDM related issues and as facilitator and promoter of CDM project activities.

At both levels initial discussions focused on answering the following questions: What is a CDM project? What are the advantages of a CDM project? How to conduct a CDM project? Where and when to conduct a CDM project? Who can undertake a CDM project? Later discussions shifted to the specifics of AR CDM project activity design and implementation. Participatory mapping to identify AR CDM eligible lands, biophysical surveys, and socioeconomic surveys were all part of the stakeholder process conducted at the community level. Discussions were conducted using a focus group discussion approach, which enables people of different social statuses from various stakeholder groups to interact as equals (Krueger 1988; Morgan 1988; Stewart and Shamdasani 1990). To promote understanding and equitability among all participants the stakeholder process was informal (but more formal at higher government level meetings), participatory, reiterative and sought to identify synergism between stakeholders' objectives and resources available to design and implement AR CDM project activities. Sometimes the local language was used to facilitate information flow and participants' sense of ownership.

Methodology

The Sidrap AR CDM project meets the criteria to use the Simplified Baseline and Monitoring Methodologies for Selected Smallscale Afforestation and Reforestation CDM Project Activity Categories (Paragraph 3, Annex II, FCCC/KP/CMP/2005/4/Add.1). Therefore, the project will consider only aboveground and belowground carbon pools in its baseline and monitoring methodologies.

Baseline: The current land cover at the project location is grasslands, with scattered shrubs covering approximately 5% of the area. Aboveground biomass was estimated from field measurements of grass and shrubs, and a weighted average for aboveground biomass of grass and shrubs was calculated, $0.95(\text{grass biomass}) + 0.05(\text{shrub biomass})$. Belowground biomass was estimated by using the root–shoot ratio from the *IPCC Good Practice Guide*. Mature trees occur infrequently across the project site. Their presence, diameter and height will be recorded before the implementation of the project, so their biomass can be excluded from actual net greenhouse gas (GHG) removal calculations.

Monitoring: Lestari Foundation in collaboration with University of Hasanuddin will conduct field monitoring of the actual GHG removals by sinks. Location of the project areas, size of each area and location of permanent sampling plots will be recorded. Diameter at breast height and height of each tree in the permanent plots will be measured every five years. Permanent sampling plots will be treated in the same way as other lands within the project boundary, *e.g.*, during site preparation, fertilization, harvesting, etc. Efforts will be made to prevent permanent sampling plots from being deforested during the crediting period. The number of plots will be determined after project implementation depending on species variation, accuracy and monitoring interval. The total number of samples will be determined as recommended by Neyman (cited by Wenger 1984).

Stratification of permanent sampling plots will be based on farms with similar species composition or biophysical conditions. Each stratum will be further developed into substrata in terms of the year to be planted. Additional substrata will be developed subsequently for areas affected by fires, pests or other problems. The stratification map will be developed on a GIS platform. As mandated by paragraph 37, Annex II, FCCC/KP/CMP/2005/4/Add.1, if during the project significant underperformance is detected in some areas, changes in carbon stocks from those areas will be treated as a separate stratum. Leakage will not be monitored as it is negligible and assumed to be zero, but the amount of nitrogen fertilizer applied by farmers will be recorded.

Project Summary

Location: The project activity is designed to take place in five villages of three subdistricts in Sidrap: Lasiwala village, Pituriawa subdistrict; Rijang Panua village, Kulo subdistrict; and Bulu Wattang, Bulu Timoreng and Cipotakari villages, Panca Rijang subdistrict (**Figure 12.1**). It will be implemented in seven discrete areas, identified by field survey in collaboration with local government agencies, community leaders and other stakeholders. The specific location of each farmer's lands to be reforested will be designated at the onset of the project; those boundaries will be treated as the actual project boundaries.

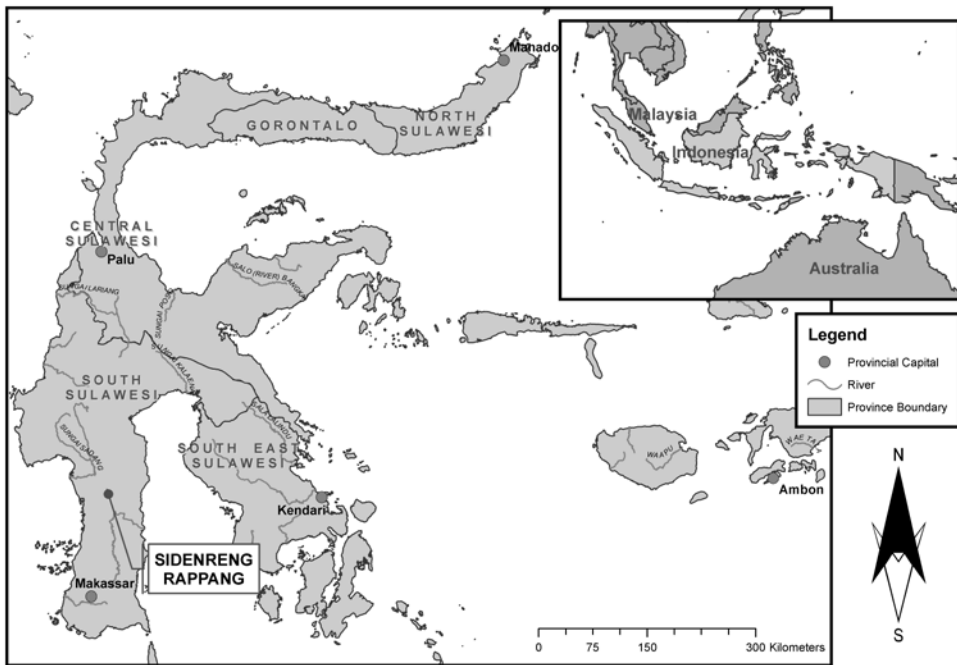


Figure 12.1. Location of the proposed Sidrap SS AR CDM project

Environmental conditions. Soil types common in Kulo and Panca Rijang subdistricts are dark grey alluvial (clays), brown podsolik (clay-loams), and complex of brown podsolik and regosol (sandy clay). Soil types of Pitu Riawa subdistrict are the same as those in Kulo and Panca Rijang, plus hydromorphic aluvial (clay), and yellowish red podsolik (loam-clay) (BPS Sidrap 2000; Bappeda Sidrap 2003a, b, c). These soils currently support the range of annual and tree crops to be established through the project activity. The topography of the project location is flat or rolling hills. The elevation of the target subdistricts is 50 m to 250 m above sea level. The temperature ranges from 32°C to 26°C. Annual precipitation is 1300–2200 mm, with bipolar distribution peaking in May and December. The dry season occurs between August and November.

Farmer profiles. Five hundred eighty-one farmers want to participate in the project activity. A socioeconomic study of 90 responding participating farmers (representing four subdistricts and four villages) specifies that most residents derive their livelihood from agriculture; few off-farm employment opportunities exist. Agriculture is an insufficient income base; 64% of the population lives at subsistence to below poverty level (Hardjanto 2006). These data correlate with government statistics (BPS Sidrap 2004). Average family size is between four and five persons, and labour availability averages three persons per family. Labour availability is insufficient for intensive annual crop production; thus families prefer tree crops over dryland annual crops. Respondents would like to expand their tree cropping systems by 1–3 ha/family, but to do so they would need financial and technical assistance, as well as secure land tenure.

Land status. The land to be reforested through project activities is non-forest state land that has never been privately owned. No people currently live on the land, although some areas are used intermittently for grass collection or cultivation. The land has been underutilized for many years. Currently there are no claims for either land use or ownership. These lands will remain state land until the central or local government grants land titles to suitable legal subjects based upon the legal process or designates the land for other activities.

Table 12.1. Stakeholders involved in the project

Stakeholder	Project Participant	Role and Responsibility
Farmers and farmer groups	Yes	<ul style="list-style-type: none"> • Establish tree-based farming systems on grasslands • Manage systems according to project agreement • Form groups or cooperatives to facilitate activities • Form CDM units to assist with project administration
Lestari Foundation and its Sidrap CDM unit (non-profit community development organization linked to MPI Reformasi)	Yes	<ul style="list-style-type: none"> • Project proponent and project administration • Coordinate community involvement • Facilitate development of memorandum of understanding among all stakeholders • Identify sources of start-up capital, carbon buyers and traders interested in purchasing tree products through the project • Publicize and promote the project
Sidrap CDM unit (district field unit of Lestari Foundation)	Yes	<ul style="list-style-type: none"> • Coordinate farmer establishment of tree-based systems • Monitor project implementation activities (seedling production, distribution, training, meetings, etc.) • Conduct field monitoring of actual GHG removals • Provide and coordinate technical training activities
District forest office	Yes	<ul style="list-style-type: none"> • Provide training in nursery production, tree management, fire control and other relevant topics • Provide financial support for that technical assistance • Assist other stakeholders that provide technical assistance
District government	No	<ul style="list-style-type: none"> • Develop supportive policy and regulatory framework • Facilitate secure land tenure during the project for participating farmers who reforest grasslands
MPI Reformasi (non-profit organization linked to forest industry)	No	<ul style="list-style-type: none"> • Assist identifying sources of start-up capital, carbon buyers and traders of forest products • Seek support from forest industry
District CDM steering committee	No	<ul style="list-style-type: none"> • Serve as district focal point for all CDM related issues • Facilitate and promote district level CDM project activities • Facilitate land tenure for farmers through the district government
Hasanuddin University	No	<ul style="list-style-type: none"> • Conduct field monitoring of actual GHG removals • Provide other technical assistance when requested
Private sector	No	<ul style="list-style-type: none"> • Purchase tree products produced through the project • Provide training regarding product market specifications • Other support to secure reliable sources of products
NGOs	No	<ul style="list-style-type: none"> • Provide advocacy and leadership training to farmer groups

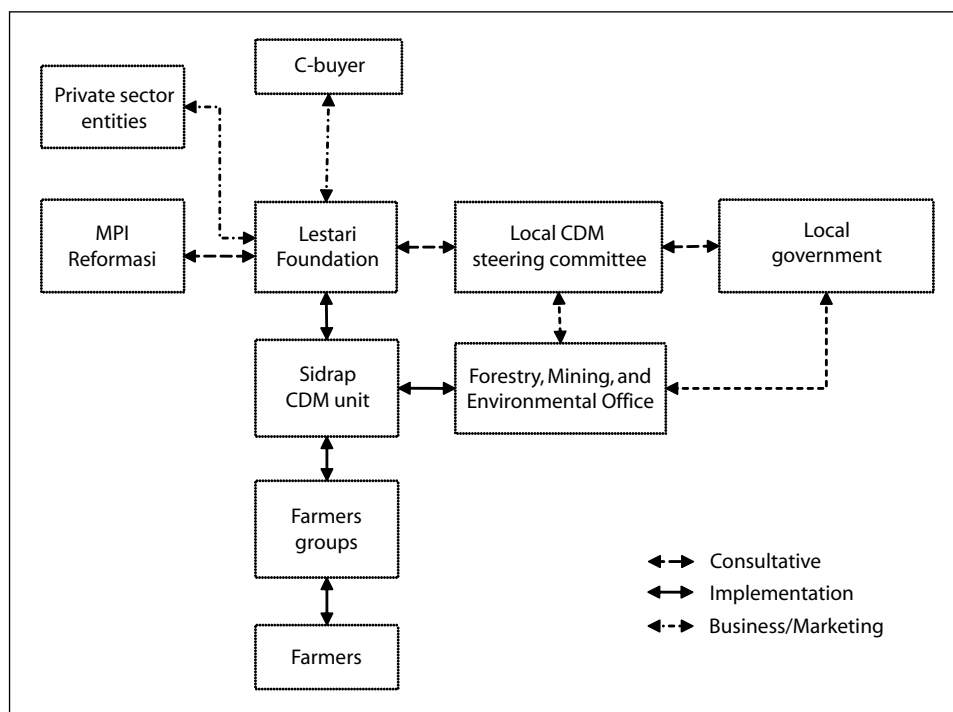


Figure 12.2. Institutional arrangement for the project activities

Project participants and linkages. Stakeholders involved in the project include communities, the district government, government technical agencies, non-profit organizations, universities, private sector organizations, and the District CDM Steering Committee, which comprises representatives from government agencies, NGOs, community leaders and farmers. However not all are project participants as defined by the UNFCCC. Project stakeholders and their roles are specified in **Table 12.1**. Linkages between stakeholders are illustrated in **Figure 12.2**.

MPI Reformasi, Lestari Foundation, the District CDM Steering Committee, the District Government and the Forestry Office will all maintain direct communicative linkages. In collaboration with Lestari Foundation, the Forestry Office will maintain direct linkages with Farmer Groups to effectively implement technical support activities. Carbon buyers and other private sector entities will interact exclusively with Lestari Foundation and MPI Reformasi. NGOs will work with Lestari Foundation and its Sidrap CDM Unit. Farmer groups and farmers will interact primarily through the Lestari Foundation and its Sidrap CDM Unit, but also have direct linkages with the Forestry Office, NGOs and other training providers. Farmer groups and farmers may contact other project parties, but are encouraged to utilize project linkages.

Project participants have agreed to share carbon payments as follows: District Government 15%, Lestari Foundation 40% and farmers 45%. All tree products produced by the tree-based systems established through the project activity will be owned by the individual farmer producer, and those products shall be sold through market linkages developed by Lestari Foundation.

Project design. Farmer participants have selected six main species to be included in the project activity: cashew (*Anacardium occidentale*), cacao (*Theobroma cacao*), cotton trees (*Ceiba pentandra*), candlenut (*Aleurites moluccana*), teak (*Tectona grandis*) and gmelina (*Gmelina arborea*). Small numbers of other species may be cultivated. The specific species to be planted will depend on the choice of individual farmers. Tree seedlings will be produced by farmers groups with technical support of other stakeholders (see **Table 12.1**). Farmers are encourage to intercrop their tree for the first 2–3 years after planting, but are forbidden from ploughing soil, which is disallowed under SS AR CDM project activities. The District Forest Office and Lestari Foundation will coordinate technical recommendations regarding tree planting and management.

Discussion and Conclusion

Stakeholder Expectations

Participating farmers expect the project to provide the following direct benefits: (i) the district government will facilitate secure land tenure through the end of the project period; (ii) farmers will be able to establish viable market-oriented tree-based systems; and (iii) other stakeholders will arrange start-up investment to initiate the project. Farmers' key expectations are enhanced incomes from the sale of tree products and carbon payments. While carbon as a product remains a bit of a mystery, the community is beginning to understand its potential. These expectations are reasonable and the community is strongly supportive of the project. Farmers state specifically that they will require assistance to participate; specifically 57% of the farmers said they require capital investment (for labour and other inputs) to establish tree-based systems. They also expect assistance with quality germplasm, technical support regarding tree management and training for awareness of market linkages and specifications. This agrees with previous analysis regarding smallholder systems for carbon sequestration and storage (Roshetko *et al.* 2006). The community also expects that additional agricultural and rural development programs will result from the success of the SS AR CDM project.

All partners expect the project to lead to sustainable socioeconomic development within the district. MPI Reformasi and its forest sector partners hope the project will result in access to additional supplies of wood and other tree products. The district government expects that the project will help develop Sidrap as a major producer of fruit, honey and timber in South Sulawesi. The district forest office, central government, and district government all expect the project to positively contribute to local and national land rehabilitation, particularly by establishing successful locally implemented models of reforestation. This includes enhanced soil conservation and watershed functions over the project area.

Baseline Scenario

Satellite imagery confirms that the project area did not have forest cover as of 31 December 1989. Field measurements and application of *IPCC Good Practice Guide*

values determined that the project sites have a baseline biomass (above and below ground) of 14 tC/ha (28 t/ha). This value is higher than at other sites in Indonesia. Kiyono (2001, 2003) found in South Kalimantan that grass biomass varied from 3.0 ± 1.3 ton/ha to 1.50 ± 0.65 tC/ha. In Lampung, Indonesia, Palm *et al.* (1999) found that *Imperata*-cassava systems had an average biomass of 2.2 tC/ha, and Hairiah (1997) found that *Imperata* grasslands had an average biomass of 0.7 tC/ha. Thus we are satisfied that 14 tC/ha is a justifiable baseline scenario.

The change of carbon stock in the absence of project activities is considered negligible for a number of reasons. The grasslands have become a climax land cover in the project area due to its tolerance of the wildfires that occur every 1–2 years. There is little chance of natural tree regeneration becoming established in this fire ecosystem. There are national and local programs to reforest or rehabilitate degraded lands, but the funds available from these sources are limited. The current rate of planting under these programs is 5 to 10 ha/year/subdistrict (or 100 ha/year for the district). Assuming a best case scenario by which these programs were renewed annually and reforestation efforts were 100% successful (both assumptions doubtful), it would require 160 years to reforest the 16,000 hectares of grasslands in the district. As Haji Abunawas's success indicates, farmers can successfully reforest grasslands. But the communities do not have the capital to invest in reforestation at any reasonable scale. Most project farmers are unable to borrow funds from commercial banks, because they cultivate state lands that do not qualify as collateral under bank regulations. To support annual crop production Sidrap farmers frequently borrow funds from local moneylenders who charge high interest rates. Farmers will not borrow to establish tree crops, however, because the return on investment period is too long, a minimum of five years for the tree crops to be established under the project.

Carbon Benefit

It is anticipated that the project will sink an average of 5,922 tons of CO₂ equivalent per year. At an annual establishment rate of 325 hectares for the first 2 years and a crediting period of 30 years, the project activity will yield an estimated net anthropogenic GHG removal of 179,335 tons.

Economic Benefit

District statistics and project surveys both show that 64% of the district population and project farmer families live at or below subsistence level (BPS Sidrap 2004; Hardjanto 2006). The project will enable these low-income communities to establish market-oriented tree-based systems. The key species to be established are cacao, cashew, candlenut, cotton tree, gmelina and teak. Cacao, cashew, candlenut and cotton tree are major commodities produced in the district for which market demand is high (BPS Sidrap 2004). Gmelina and teak are timber products with strong demand in the district forest sector (MPI Reformasi personal communications). Yields from annual crops will provide farmers household products and income year 1 through 3 of the project. By developing a diversified tree-based system farmers will be protected from the price fluctuation that may affect any of these commodities. Returns from cashew and cacao will begin in year 5; it is recommended that gmelina timber be harvested

in year 10 and teak timber not before year 20 (waiting to harvest teak until year 30 is advised). Independent of carbon payments, establishment of these tree-based systems will have a positive economic impact on participating farmer families. Income from carbon payments will be an additional payment for environmental services (Roshetko *et al.* 2006).

Transaction Costs

It is important to provide farmers with the capital investment and technical training to enable them to transform their traditional low-management systems into more intensive systems that yield tree products of the quantity and quality to meet market specifications and command a higher price. Providing these financial and technical services to multiple clients (581 farmers), as well as facilitating and administering the project and monitoring activities and the actual GHG removals, is likely to result in high transaction costs for this or any SS AR CDM project. While these (high) costs are justifiable under the CDM as the extra costs required to achieve more equity and sustainable development, they are not likely to be underwritten by carbon investors who are more interested in securing carbon credits and have alternative investment opportunities such as large plantations or energy projects (Roshetko *et al.* 2006). It is anticipated that local cofunding sources will be identified to help offset high transaction costs, including the development of assistance from government, foundation or corporate sources (CIFOR 2000, 2001). Some stakeholders have agreed to use existing resources to facilitate project activities and thus leverage support. This includes the participating farmers, who will provide labour equity to cover 15% of the project establishment costs (direct project costs during the first 2 years). Lestari Foundation and the Forest Office will also support administration, facilitation and training costs unless or until other sources of funds are secured.

Environmental Impact

The proposed project areas were converted from natural lowland forest ecosystems during and prior to the 1960s. The current mosaic of land use systems includes the private holdings of small-scale farmers, government land (primarily grasslands, including areas targeted for reforestation by the project activity), areas of degraded secondary forests and small pockets of natural forests. Under the project farmers will replace grasslands with tree gardens of cashew (*Anacardium occidentale*), cacao (*Theobroma cacao*), cotton trees (*Ceiba pentandra*), candlenut (*Aleurites moluccana*), teak (*Tectona grandis*) and gmelina (*Gmelina arborea*). All six of the species are established components of the existing Sidrap landscape. The fauna of Sulawesi is one of the most distinctive in all of Indonesia. The island's indigenous species include at least 127 mammals, 332 birds, 29 amphibian and 40 lizards. Many of these species are endemic. The International Union for the Conservation of Nature considers 16 of Sulawesi's indigenous species rare or endangered (Whitten *et al.* 2002). The existing land cover at the project location, grasslands with scattered trees, is unsuitable for these indigenous species. The project will improve environmental conditions by re-establishing forest cover, with native or naturalized species. These forest areas will offer higher habitat value to native fauna, particularly migratory birds, than the

existing grasslands. It is fair to forecast that these forest areas will be maintained and sustainably managed by farmers as a key component of household livelihood strategy that produces profitable crops with strong market demand for years to come.

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