

# Women Produce Less Carbon?: A Study of Women in Cianjur Agroforestry, West Java

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**Abstract.** *Forest and agriculture are important to climate change mitigation. Firstly because of the significance of their carbon stock and secondly because their exchange of greenhouse gases between the atmosphere and soils and vegetation can go both ways. As we recognize human and its society is a part of global ecosystem, the similar ways find in the combination between agriculture and forestry in agroforestry. Cianjur agroforestry, with enormous women's role in it, is a sustainable system that combines forestry and agricultural practices. Women become a key player to maintain ecosystem services from forest and benefit from crops in agroforestry. Women 'force' the society to maintain the carbon stocks within their forest and emits greenhouse gases only in an amount which can be absorbed by nature.*

**Keywords:** *Cianjur, West Java, agroforestry, women, carbon stocks, greenhouse gases.*

**JEL Codes:** *Q23*

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## **Introduction**

ASEAN countries, like other countries in the world, are now faced with many critical issues, like energy crisis, water problem, food problem, waste issue, shortage of natural resources, public health, natural disasters, etc. One of the big and fundamental facts is that contemporary society is heading to unsustainable conditions of life, because of basically waste of energy, dependence of almost all of our energy on the outside world through imports, and increasing the load on ecological system.

So it is imperative that we get rid of these conditions and will construct a sustainable society in order to find ways out of the crises, such as global warming, excessive and large scale of consumption of natural resources, and ecosystem degradation. It is very clear that constructing a sustainable society where people would be blessed with safe and secure life free from danger will not be materialized without much effort in the fields of energy, resources and ecosystem. In other words, a sustainable society will be constructed on the basis of "low carbon society", "resource-circulating society" and "society coexisting with nature".

In this connection I am interested in "society coexisting with nature", and paying attention to environmental issue, forest issue in particular. Because conservation of forest, especially tropical rain forest rich in Indonesia, its proper utilization & management is related to coexistence with natural environment,

resource-circulating system and lowering carbon emission.

In this paper I am going to deal with agroforestry with relation to “society coexisting with nature”. As for the formation of “society coexisting with nature”, until now a stronger emphasis has been placed on nature preservation of certain area, administration of natural parks and national parks, while efforts to build a harmonious society between natural environment and human activity have not fully been done. Building “society coexisting with nature”, taking into account interaction with “low-carbon society” and “resource-circulating society”, is one of the urgent tasks to be tackled from now on.

Agroforestry in West Java would give us numerous suggestions when thinking of a vision of the formation of “society coexisting with nature”, where natural environment is controlled within certain limits. Production activities are managed within the limit of not damaging reproduction ability of nature and local codes of conduct based on communal land and common facilities make proper management possible. Agroforestry would reevaluate the traditional land utilization system and preserve biodiversity, instead of large scale of agricultural development. Agroforestry and its proper management would contribute to the formation of sustainable society coexisting with nature and environment, where it is needed to achieve a good balance between use of natural resources and maintenance of ecosystem through sustainable use of natural resources, conservation of ecological system, promotion of utilization of biomass energy, etc.

These efforts at the local community would contribute and lead to the realization of sustainable society at the national level, then in the regional level like ASEAN, then in the global society.

One of example of relation between local community and the natural resources is agro-forestry. Agro-forestry is a practice of agricultural activities by community on forest or mimicry forest land. This type of relation is a perfect example of how human, both men and women, maximizing the function of forest for their livelihood. Paying attention to gender perspective in analysis of agroforestry management is very important in term of sustainability.

Searching for a sustainable forest management is very crucial for Indonesia. It is because Indonesia is one country with fairly extensive forest land. Indonesia, after Brazil and Cameroon, has 120 acres of tropical forest. With a vast forest area, then the damage to forest land making Indonesia the country with the highest deforestation rates. Based on the Data of the Forestry Department, the rate of forest destruction and decline during 1985 to 2005 averaged about 1.9 million hectares per year in Sumatra, Kalimantan and Papua. Forest destruction in Indonesia, as was in other developing countries, often caused by economic factors and unsustainable development practices. In addition to the need for forest products, especially timber, human population growth which increased demand for settlement and food, causes the conversion of forest land into agriculture and settlements.

Forests, especially natural forests have a very important ecosystem services. Those services include water/hydrology regulation, storage of genetic resources, regulating climate and forest soil fertility and sinks (sinks) of carbon. On the other hand, agricultural activities are also claimed to have a range of services that benefit human and environment. Agriculture has a role in not only commodities, but also produce non-commodity outputs such as beauty of nature (landscapes) and cultural heritage.

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## Method

The method used here was a mix between qualitative and quantitative methods. These two methods were used in both villages, Cijedil and Wangunjaya in Cugenang, Cianjur, West Java. Depth interviews with 17 informant and discussion within community were conducted to acquire data thickness. Social survey to 110 respondent were also conducted to collected quantitative data. The study also employed participatory observation techniques. This techniques was used to make space for the researcher to connect with women and catch the expression of their experiences, views, and ideas related to the practice of agroforestry and the building of a low carbon society.

## Women in Agro-forestry

Indonesia, specifically Java, has a long story on women's activities related to agricultural and forest management. In colonial era, in Daendels teak forest management, women were only a 'cheerleader' in teak production and distribution (Pelluso, 1992). Agricultural activities on forest land was pioneered in reforestation program in 1873 with taungya or tumpangsari methods. Pelluso (1992) described this method worked as follows: after a forest area was clearcut, local cultivators were sought to clean the rest of the land and plant teak seeds in certain measurement row. Between the rows, the planters could grow agricultural crops such as rice, corn, or tobacco for one and two years. The agricultural crops belong to the planters, they also receive a nominal cash fee. They were allowed to collect fallen or dead wood. By 1912 61% of reforestation in Java was done by tumpangsari; by 1928 the system share accounted for more than 94%.

By time, the tumpangsari or farming on forest land was changing. The dynamic practices which affected by the dynamic social economy and culture process surrounding the forest community. Overall, there are several stages of cultivation of agricultural activities involving women workers. According to Dove (1988), in outside Java, stages of farming activities in the community Kantu 'in West Kalimantan consist of: (1) choosing field location, (2) cutting, (3) hewing, (4) burning, (5) plant, (6) weed, (7) maintain, (9) harvesting, and (10) transport. While stages on farming or *ngahuma* Baduy (Iskandar, 1992), consisting of: (1) seting land, (2) land preparation, (3) planting, (4) maintain the plant, (5) harvesting, and (6) to save the crop.

Stages of farming activities are generally, though not a binding rule, distinguished by gender. For example, slashing and cutting down in Kantu tribe 'or setting up of land, is the work of men. While planting and weeding or maintaining are the work of women. Although it is not impossible for women to also do the work that is considered men's work or vice versa. Dove (1988) also described that the division of labor by sex in the fields, among them, was based on the practice carried out by the community Kantu '. This is evident in the statement: "... *Even though both men and women carry out the weeding, the contribution given by the women obviously greater.*"

The quite critical review about gender in the management of upland agriculture with agroforestry systems, was undertaken by Christanty, et.al. in 1989. One of the outcomes of the study is the distribution of labor between men and women was based on the difficulty level type of work. The study implies that all types of very heavy work (*very demanding*) were done by male, mild or moderate (*light / intermediate*) entirely and / or most by women.

Women have an important role in agro-ecosystem. They maintain the food production by managing forest land for sustainable food supply to household. In this case, women establish a sustainable practice of agro-ecosystem. Almost 20 years after Christanty's study in Soreang, labor division in agriculture encountered an enormous change in my study (Table 1). Very demanding and demanding type of works were not only occupied by men farmers. The gender value that women were not able to do 'muscular' works has broken down. Such thing occur in Cianjur (table 2). Both men and women do every type of work in agroforestry.

Another important role of women in agro-ecosystem is show in food production. They maintain the food production by managing forest land for sustainable food supply to household. In this case, women establish a sustainable practice of agro-ecosystem. According to Christanty's (1989) and Wiyanti's (2008) study, both at the different time of study, women are the main stakeholder that preserves food for the family. The same case also occurred in Cianjur where women are also the main subject in preserve food for the family.

### **Women supporting sustainable agroforestry and their effect to the climate change**

As one type of agricultural activities, agroforestry considered as a type of sustainable agriculture. The FAO working definition of sustainable agriculture is a "Sustainable development is the management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in the agriculture, forestry and fishery sectors) conserves land, preserves water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable." (FAO 1994). According to Lynam and Herdt (1989), sustainability in agriculture has to be defined with respect to systems (in our case agrarian systems) rather than doing singular analyses of inputs and outputs, because crop varieties and inputs produce nothing in isolation. Only when combined as components of a system do they produce output.. As they understand sustainability as a result of the relationship between technologies, inputs and management used on a particular resource base within a given socio-economic context, three aspects of systems such as spatial level, time and the different dimensions have to be taken into account.

In spatial level, systems exist within a large range of spaces: global, regional, farm, field, individual plants and microscopic. Herdt and Steiner (1995) argued that this showed one of the major difficulties of the concept of sustainability and reinforces the need to define carefully the spatial dimension. The number of levels and their interconnections is part of the problem of determining when sustainability is an inherent property of a given system and when sustainability is so dependent on external forces that it can be most usefully examined at a higher-level system. In time, the idea of sustainability can only be seen in relation to

a certain time period. Taking into account the time dimension is getting difficult considering that, the real world agricultural production systems are constantly changing. And in dimensions, usually three dimensions are mentioned, the *biological/physical*, the *economic* and the *social dimensions*. But actually, there are even more of them. The following points are of major importance for specifying the concept, for example *Ethic dimension* --- inter-generation fairness as an ethical concept for the future.

As seen at the site studied, the three dimensions of sustainability in agroforestry practices are interrelated. The biological/physical dimension was shown in the diversity of management of land that also support the diversity of trees/crops type. The economic dimension pictured in the use of harvest is not only for subsistence purposes but also for commercial purpose. The social dimension, specific in this study, role of women, is captured that the missing men partner increase the role of women in agroforestry practice.

On the socioeconomic side, it has been found that forest communities' vulnerability is based mainly on the lack of access to markets and the existence of migratory outflows resulting in a shortage of agricultural labor. Although villagers can obtain exploitation rights on the forest area the technical requirements for exploitation of national forests might become a barrier for local communities, therefore reducing their access to forests. In addition, only exploitation for subsistence is allowed in community forests. Nevertheless, the rural exodus reduces pressure on natural resources, leaving a margin of resilience. The communities' weak social capital increases vulnerability. Customary institutions are not well developed and have few or unknown management rights over forest. External institutions are not well established either. This results in a lack of community-level decision making being integrated into higher level decision-making processes. Political macro-decisions such as bans on kerosene as source of energy for household have direct and indirect negative impacts on rural livelihoods.

On the ecological side, vulnerability is framed by the status of natural resources and the impact of climate stimuli. Forest degradation limits community adaptive capacity in difficult periods. The most important climate change impacts are increased temperatures, torrential rains and erratic/changing rainfall patterns, and, to a lesser extent, strong winds. Farmers indicate that droughts are the major climatic threat, while torrential rains and a shift in the seasons are secondary. Drought can refer to different climatic conditions based on villagers' perceptions: late arrival of the rainy season, decrease of rainfall during the dry months, longer dry spells during the dry season; perception of drought can be also influenced by higher temperatures or decreased water flow in rivers.

Sustainable forest and agroforestry management within REDD+ which is setting simple management plans (SMPs) for community forests, should go through a legal procedure to ensure land performance for the community. The SMP will integrate REDD+ and adaptation, including the development of a management manual, and will be based on analyses of community vulnerability. The sustainable forest management within REDD+ improves carbon stocks through selection of best practices and species for adaptation within stronger financial capital. The best practices of forest and agroforestry will also conserve water sources, emphasis on local species, will improve green corridors for fauna, establish new income sources, food and health security, and secure forest tenure rights.

Farming practices, such as agroforestry and tree domestication establishing a

tree nursery and distributing saplings among farmers, with the main species being those of edible and medicinal value, increased carbon stocks. Tree domestication brings about defends from floods, strong winds and soil erosion; stronger financial capital emphasis on local species; new income sources, more secure crops; livelihood diversification, food and health security, diversification of forage sources for livestock.

### **Cianjur Agroforestry as a Low Carbon Society**

“A low carbon society” in the ultimate sense would be a society that emits greenhouse gases only in an amount which can be absorbed by nature (Carbon Neutral Society). To achieve this goal, we have to construct a social system where all sectors, such as industries, governments, and citizens, will naturally or automatically give special consideration to their selection and decisions in order to minimize carbon-dioxide emissions (carbon minimization). In order to secure the CO<sub>2</sub> absorption and to adapt to the unavoidable climate change, it is important to maintain and restore rich, diverse natural environments such as forest.

Forest and agricultural land are important to climate change mitigation. Firstly because of the significance of their carbon stock and secondly because their exchange of greenhouse gases between the atmosphere and soils and vegetation can go both ways. Many human activities such as logging, grazing of livestock or ploughing, influence the exchange of greenhouse gases with the atmosphere and ultimately the carbon footprint of the sector. In relation to climate change, forestry and agriculture are about to removals, emission and storage. Removals result from the capacity of plants and soils to ‘suck in’ and retain greenhouses gases from the atmosphere through the process of photosynthesis. Removals take place when trees or organic material grow up in soil. Emissions take place for instance when plants die and decay or when soil is disturbed so that their capacity to store is decreased. This would be the case when trees or crops are harvested. If wetland is drained or if grassland is ploughed. Carbon dioxide (CO<sub>2</sub>) differs from the other major greenhouse gases relevant to the sector in that the carbon can be stored in large quantities in the various carbon pools in vegetation, soils and living organisms. As an illustration, it is estimated that the release of just 0.1% of the carbon currently stored in European soils would equal the annual emissions from 100 million cars.

Emissions and removals from forest and agriculture in non-industrialized countries are for the time being not governed by any internationally agreed legally binding framework. Policy development related to forests in non-industrialized countries are covered in the framework called REDD+ the UN program for Reducing Emission from Deforestation and Forest Degradation. Emissions from deforestation and forest degradation in developing countries remain difficult to quantify. They constitute around one sixth global CO<sub>2</sub> emissions, or one eight of global greenhouse gas emissions. At the same time nearly one billion vulnerable people depend on these forests for food, water, shelter, and energy.

### **Conclusion**

The role of women in food production in the household remain sustain. Women play important roles in this aspect. The same thing happens when they act as a key person in agroforestry. Maintaining food supply for the family is the first target to achieve when women manage the agroforestry system.

The changing of agroforestry practices in both Soreang and Cianjur also provides examples of flexibility of women and gender roles to adjust environmental change, particularly in the agro-forestry system. Through their actions on agro-forest practices, new identities are emerging in the division of labor. In other words, gender based labor division in agroforestry is negotiable and can be change.

In ecological aspect, the increasing role of women in agroforestry management can be also a hope for the future of forest in Indonesia. As we noticed that people participation in forest management in Indonesia is one thing that we cannot avoid. As women became the important players, their participation and efforts to sustain the forest under agroforestry practice, are also become very important. These will be related to the changing of climate and the whole environment. The practice of agriculture that also maintains forest, the livelihood that women pursue in their daily activities, their relation to the environment and its effects, are the figure of a low carbon society in the small scale level.

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### **References**

- Abdoellah, Oekan S., et.al. 2005. *Commercialization of Homegardens in an Indonesian Village: Vegetation Composition and Functional Changes*. the Institute of Ecology and the Research Institute of Padjadjaran University. Bandung.
- Abdoellah, O.S. & J. Iskandar. 2001. Membangun Pertanian Masa Depan Berdasarkan Asas Ekologi: Kasus DAS Citarum Hulu-Jawa Barat. Dalam: Pengelolaan Daerah Aliran Sungai: Permasalahan dan Tantangan. *Ekologi dan Pembangunan*. Bandung: PPSDAL-Lemlit-Universitas Padjadjaran. pp : 40 – 49.
- Christanty, Linda. 1989. *Analysis of the Sustainability and Management of the Talun-Kebun System of West Java, Indonesia*. Doctoral Thesis. The Faculty of Graduate Studies Interdisciplinary Department, Resource Management Program. The University of British Columbia.Vancouver.
- Collier, William L., et.al. 1996. *Pendekatan Baru dalam Pembangunan Pedesaan di Jawa*. Yayasan Obor Indonesia. Jakarta.
- Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neil, R.V., Paruelo, J., Raskin, R.G., Sutton, P. & van den Belt, M. 1997. The value of the world's ecosystem services and natural capital. *Nature* **387**, 253-260.
- Dove, Michael R. 1988. *Sistem Perladangan di Indonesia: Suatu Studi Kasus dari Kalimantan Barat*. Gadjah Mada University Press. Jogjakarta.
- Fox, J. J. 1991. *Managing the Ecology of Rice Production in Indonesia*. Harjojo, J. (eds). *Indonesia: Resources, Ecology, and Environment*. Singapore: Oxford

- University Press. pp: 61 -83.
- Iskandar, M.Sc. Drs. 1992. Ekologi Perladangan di Indonesia: Studi Kasus dari Daerah Baduy Banten Selatan Jawa Barat. Djambatan. Jakarta.
- Parikesit, et.al. 2003. *Non-forest Fuelwood Acquisition and Transition in Type of Energy for Domestic Uses in Changing Agricultural Landscape of the Upper Citarum Watershed Indonesia*. Dalam Hayashi, Yoshiro et.al. (eds.). 2003. *Sustainable Agriculture in Rural Indonesia*. Gadjah Mada University Press. Yogyakarta.
- Peluso, Nancy Lee. 1992. Rich Forest, Poor People – Research Control and Resistance in Java. University of California Press.
- Soemarwoto, Otto dan Idjah Soemarwoto. 1984. *The Javanese Rural Ecosystem*. Dalam A. Terry Rambo dan Percy E. Sajise (eds.), *An Introduction to Human Ecology Research on Agricultural System in Southeast Asia*. University of the Philippines. Los Banos.
- Soemarwoto, Otto., et.al. 1985. *The Talun Kebun: a Man Made Forest Fitted to Family Needs*. Dalam In Food and Nutrition Bulletin.
- Stoler, Ann. 1982. *Struktur Kelas dan Otonomi Wanita di Pedesaan Jawa*. Dalam Koentjaraningrat (ed.), *Masalah-masalah Pembangunan: Bunga Rampai Antropologi Terapan*. LP3ES. Jakarta.
- Strauss, Anselm dan Juliet Corbin. 2003. *Dasar-dasar Penelitian Kualitatif: Tatalangkah dan Teknik-teknik Teoritisasi Data*. Pustaka Pelajar Offset. Yogyakarta.
- Suzuki, Regan --- Editor. Gender and REDD+ --- Bulletin REDD-Net Asia-Pacific Edisi 04 - Mei 2011.
- Wiyanti, Dede Tresna. 2008. Role of Women in the Kebun Talun System in Karamatmulya Village, Soreang, Kabupaten Bandung, West Java. Master Thesis. Padjadjaran University.



**Table 1** Gender Based Labour Division in Agroforestry

Type of Work	Labor			
	Christanty's		Wiyanti's	
	Male	Female	Male	Female
<b>Opening Phase of Land</b>				
Clean grass and dry leaves	√	√	√	√
Collect grass and leaves	√	√	√	√
Burning of grass and dead leaves ( <i>ash</i> residue)	√	X	√	√
Taking and collecting small twigs and leaves of	√	X	√	√
Cutting down bamboo	√	X	√	√
Reversing the ground with a hoe	√	X	√	√
Collecting bamboo leaves in bamboo <i>stumps</i> ,	√	√	√	√
Burning of leaves and twigs of bamboo ( <i>ash</i> )	√	X	√	√
Collecting and sorting bamboo	√	X	√	√
Transporting bamboo to house / market	√	X	√	√
<b>Gardening Preparation Phase</b>				
Hoeing	√	X	√	√
Sow the seeds of vegetables: cengek / leunca /	X	√	√	√
Make holes for tuturus roay plantation	√	X	√	√
Plugging <i>tuturus</i> roay	√	X	√	√
<b>Phase Gardening</b>				
Plant	X	√	√	√
Hoeing	√	X	√	√
Make holes to plant roay seeds	√	X	√	X
Making sewerage	√	X	√	√
Giving manure	√	√	√	√
Fertilize	√	√	√	√
Weed		√	√	√
<b>Harvest Stage</b>				
Harvest cucumbers	√	√	√	√
Harvest cengek / leunca / tomato	√	√	√	√
Harvest roay	√	√	√	√
<b>Post-Harvest Stage</b>				
Transporting the crop	√	X	√	√
Pod roay	√	√	X	√
Sell their harvest	√	√	√	√
Cooking	X	√	X	√

Source: Christanty (1989) and Wiyanti (2008)

**Table 2** Gender Based Labor Division in Agroforestry (Cianjur)

Type of Work	Men	Women
Seeding Preparation	√	√
Clearing land and hoeing	√	√
Cultivating	√	√
Fertilizing	√	√
Weeding	√	√
watering (if needed)	√	√
Harvesting	√	√
harvest transport	√	√

Source: Survey, 2012

Figure 1 Post-harvesting activity



Figure 2 Women doing “Men’s” work

