

Green Campus Initiative at Jawahar Navodaya Vidyalaya – Puducherry

Report on Project overview and Inauguration ceremony



APSCC



Contents

Highlights of the Initiative	3
Background and Introduction	4
Project Site Description	8
Constructed Wetland for Water Reclamation and Reuse.....	11
Xeriscaping for Biodiversity Conservation & Habitat Restoration	12
Kitchen Waste to Biogas: Anaerobic Digester.....	13
Composting for Soil Remediation	14
Hügelkultur - Raised Garden Beds.....	15
Bio-fertilizer and Bio-pesticide Production	16
Green House for Organic Olericulture and Hydroponics	17
Organic Farming and Women Empowerment	18
JCL and Pollution Control	19
Office of Sustainability	20
Acknowledgements	23

This Report was developed and authored in 2013 by Mrs. Golda A. Edwin and Mr. Nandhivarman Muthu, the Project Researchers



ASSOCIATION FOR PROMOTING SUSTAINABILITY
IN CAMPUSES AND COMMUNITIES

23, Kamaraj Salai, Thattanchavady,
Puducherry – 605009, India
Phone +91-8870854633 • Email info@apsccindia.org • www.apsccindia.org

Highlights of the Initiative

- The Green Campus Initiative (GCI) is first of its kind in Puducherry region and also among over 550 Jawahar Navodaya Vidyalaya (JNV) of India
- It is implemented by the Association for Promoting Sustainability in Campuses and Communities (APSCC) and Mr. A. Vinayathan, Principal, Jawahar Navodaya Vidyalaya (JNV), Puducherry
- GCI at JNV is based on the doctoral research of Mrs. Golda A. Edwin and Mr. Nandhivarman respectively, under the guidance of Dr G Poyyamoli, Associate Professor from the Department of Ecology and Environmental Sciences, Pondicherry University
- This initiative is funded through the research fellowship received by Mrs. Golda A. Edwin and Mr. Nandhivarman from Universities Grants Commission (UGC), New Delhi routed via Pondicherry University (PU) along with the contingency grants
- The phase one of the GCI has ten different components integrated with novel approach keeping education, action research and outreach as the core agenda
- This initiative emphasizes more on water security, food security, energy security, mitigating climate change, women empowerment and furthering green economy
- Team effort, cooperation and understanding among the Community Service Scheme/National Service Scheme students, student volunteers, teaching/ non-teaching staffs, Vice Principal and Principal of the school enabled the completion of all 10 integrated components within 100 working days
- The APSCC team founded a students and staffs centered mass movement called “Green Campus Initiative Cooperative Movement (GCICM)”, focusing not only on the development of campus but also furthering education, action research, outreach and women empowerment for sustainable development
- All the ten initiatives are tailor made considering the site specificities and the locally available natural resources
- Two projects of this GCI entitled (1) “Anaerobic Bio-digester” and (2) “Constructed Wetland” were recognized as best science projects from Puducherry, at the 20th National Children’s Science Congress, held at Banaras Hindu University, 27th to 31st December 2012 and the team children received 5 medals
- This initiative was presented through video conferencing by APSCC on 8th Feb 2013 to the global audience at “Teach In Day”, Perugia University, Italy

Background and Introduction

Even though the origins of the terms 'sustainable development' or 'sustainability' goes back many decades, it was substantially enhanced since the Brundtland Report (1987), which is also known as Our Common Future. Shortly after this, in June 1992, the United Nations congregation initiated the UN Conference on Environment and Development (UNCED), in Rio de Janeiro, Brazil. Over the past two decades, across the globe, the term 'sustainable development' or 'sustainability' has found its way into the International conventions and agreements, government and non-government agencies/ enterprises, universities, higher educational institutions, schools, NGO's, CBO's, etc.. More importantly, the modern views of sustainable development are not limited to ecological considerations confined to one sect; rather currently the economic, social, cultural and political dimensions are also being embraced.

As a general observation of institutional campuses across India, their growths over a period of time have resulted in unsustainable resource extraction and utilization, resulting in the degradation of quality of campus environment and life. In fact many campuses have already lost the quality of basic life support systems like water, soil and air. Unless the resources are managed sustainably, it will result in the "Loss of Ecosystem Services and Ecological carrying capacity of the campus". Therefore, the needs and necessities of each campus should be managed to create an environment of self-scrutiny, experimentation and innovation with an integrated approach.

The drive to attain the "GREEN CAMPUS" status is to serve as a model at the local/regional level, where all the processes and operational functions of the campus are closely knit, providing educational and practical value to the institution and the surrounding environment.

Each and every campus is endowed with a measurable stock of environmental assets such as top soil, flora and fauna, fertile and non-cultivable land, ground and surface water, clean air, etc. It is the responsibility of every individual of the campus to embrace the Principle of Intergenerational equity "as members of the present generation, we hold the earth in full trust for future generations", which in recent years emphasized by many bilateral and multilateral agreements, declarations and resolutions for Sustainable Development (SD).

For several decades now, many institutions are doing their best to strive towards a sustainable future through education and research. The Government has also adopted a new paradigm of thinking and development since Post-Stockholm Conference (1972) called Sustainable Development (SD). Following the Brundtland Report, India became part of 187 countries agreeing on carrying out an important commitment towards SD by signing the Rio Declaration during 1992 UN Conference on Environment and Development. The goal towards a sustainable future became finer when India became part of UN General Assembly resolution for establishing the UN Decade of Education for Sustainable Development (UN DESD, 2005-2014) in the year 2005, emphasizing Agenda 21, that education is an essential tool and an indispensable element for achieving sustainable development.

To reenergize and to foster the objectives of DESD at an institutional level, Mrs. Golda A Edwin founded the “Green Campus Initiative Co-operative Movement” (GCICM), primarily to empower the student community and involve them through practical learning and networking on a global scale to become sustainable leaders of tomorrow. There are several strategies incorporated into GCICM for the active participation of girl students and teachers, thereby emphasizing on the “Global action for women towards sustainable and equitable development” which was endorsed by the international community with several plans of action and conventions for the full, equal and beneficial integration of women in all development



Fig 1. Honorable Lt. Governor of Puducherry, Dr. Iqbal Singh with the GCI Project Researcher, Smt. Golda A. Edwin

GCICM is formed to achieve, the objectives of campus sustainability through life giving cooperation and coordination, by creating awareness, mobilizing resources and setting up an environment of opportunity to develop and implement tailor made programs to enrich the sustainability quotient of the campus, emphasizing that education is an indispensable element for achieving sustainable development

activities. This movement is inaugurated by a consortium of women leaders headed by Smt. Dr. Chandra Krishnamurthy, Vice Chancellor of Pondicherry University on the eve of International women’s day 2013 (Figure 3).

The Association for Promoting Sustainability in Campuses and Communities (APSCC), which is driving this movement, was founded to serve as an impetus organization for sustainable development among the educational institutions and local communities in India.

The agenda of APSCC for campus sustainability is “to implement the effective and immediate measures to prevent environmental degradation”, which is purely based on the Precautionary principle 15 of the Rio Declaration. It also furthers the 3rd and 7th Millennium Developmental goals with women as the integral part to achieving all MDG’s. Women have a prime and vital role in environmental management and development and their full participation is therefore essential for the overall sustainable development.

The driving force of this initiative is based on the action plan framework embracing the following principles.



Fig 2: Honorable Chief Minister of Puducherry, Shri. N. Rangasamy with the GCI Project Researcher Shri. Nandhivarman Muthu

- **Principle of Inter-generational Equity:** “as members of the present generation, we hold the earth in full trust for future generations”

- **Art.3 of the UN Conference on Climate Change:** “The parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities”.

- **Principle 3 of the Rio Declaration:** “the right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations”.

- **Precautionary principle 15 of Rio Declaration:** “where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as reason for postponing cost effective measures to prevent environmental degradation”

This movement will likely be an historical initiative in India providing an additional momentum, for the efforts taken by the Government fostering MDG’s and Decade of Education for Sustainable Development (2005 -14), and with much focus on what educational institutions can achieve in this regard for the region/ country and also for their campus environment sustainability.

The multiple dimensions of environmental sustainability demands a robust framework that can effectively cover all or most of the dimensions in a way that is logical, comprehensive and easily adoptable, embracing social and environmental justice. Mr. A. Vinayathan, Principal, Jawahar Navodaya Vidyalaya (JNV) joined hands with APSCC, to initiate GCI at JNV. GCI at JNV is based on the doctoral research of Mrs. Golda A. Edwin and Mr. Nandhivarman respectively, under the guidance of Dr. G. Poyyamoli, Associate Professor from the Department of Ecology and Environmental Sciences, Pondicherry University.

Their dissertations were developed as a living model and implemented at JNV through APSCC, emphasizing on water security, food security, energy security, mitigating climate change and furthering green economy. The initiative was funded through the research fellowship received by Mrs. Golda A Edwin and Mr. Nandhivarman Muthu from Universities

Grants Commission (UGC), New Delhi routed via Pondicherry University (PU) along with the contingency grants.

The initiative serves as an example that Sustainable Development (SD) as a whole will be achieved only when everyone is benefitted through cooperation and coordination, keeping education, action research and outreach as indispensable/integral elements. This project was evolved and implemented through the principal implementer “Association for Promoting Sustainability in Campuses and Communities” (APSCC), Puducherry, India, which has the major objective of facilitating the transfer of green sustainable practices at schools, Higher Educational Institutions (HEIs) and their neighborhoods.



Fig 3: Official Inauguration of “Green Campus Initiative Cooperative Movement” by Smt. Dr. Chandra Krishnamurthy, Vice Chancellor, Pondicherry University

Green Campus Initiative is the initiative that delivers a sustainable package to the campus environment by the campus community to protect & enhance the health and well-being of humans & ecosystems

This frame work is characterized by a dynamic paradigm with a wide assumption that not only governments, but also each and every individual, institutions and even businesses or industries has to play a major role and need to commit themselves to sustainable development of the region. This frame work as a microcosm was tested and developed in a pre pilot scale in 1500 square feet of area at Thattanchavady, Puducherry. This was then further scaled up and implemented on a pilot scale, at Jawahar Navodaya Vidyalaya, a residential central school, (MHRD) Puducherry. This framework has a multidimensional approach addressing various global environmental challenges/ issues, based on the researches done globally, which was then carefully knit to evolve as a package to suit Indian socio cultural, economical and political scenario.

Project Site Description

The project location Jawahar Navodaya Vidyalaya (JNV), is a residential central school located at Puducherry which is one of the Union Territories of India, situated on the Coromandal coast, 160 kms. South of Chennai, (11° 56' N; 79° 53'E) comprising of four geographically disconnected regions (Figure 4). JNV is a fully residential co- educational institution established in the year 1986-87 under Ministry of Human Resource Development (MHRD), Government of India.

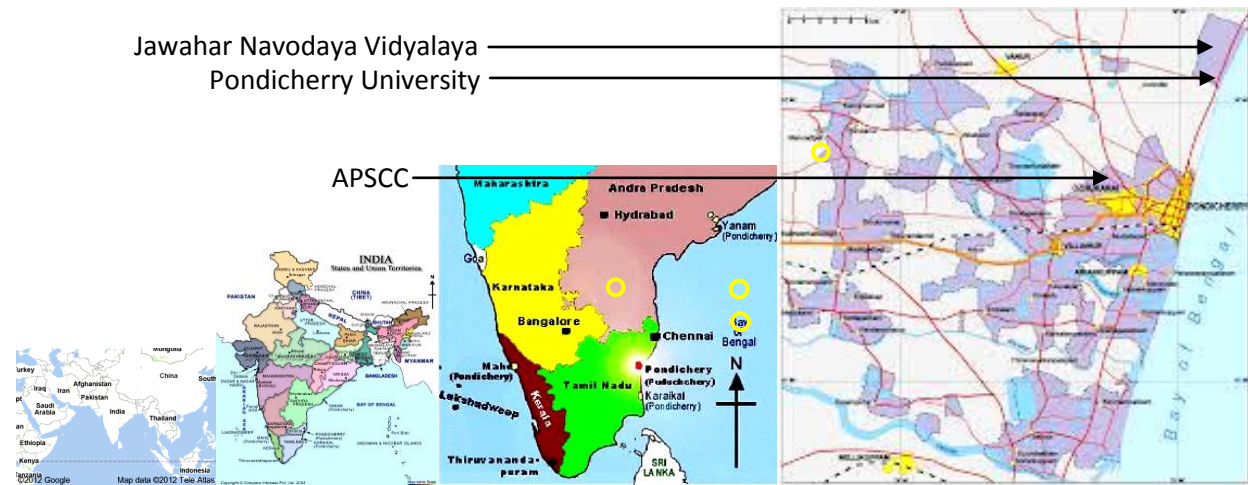


Fig 4: Map showing the 4 geographically disconnected regions of Puducherry and location of JNV, Pondicherry University and APSCC



Fig 5. Location of the various components of the Green Campus Initiative (phase I) at Jawahar Navodaya Vidyalaya (JNV)

Among other initiatives, APSCC has adopted JNV- Puducherry to implement demonstrable sustainability related initiatives which will become the first of its kind among JNV's of India and for the Puducherry region as well. The main objective of this research oriented project is to serve as a model for other schools and higher educational institutions to follow or adopt strategies from this Green campus Initiative for their campus environment sustainability. The phase 1 of this initiative has a novel integration of ten components such as

1. Constructed Wetland for Water Reclamation and Reuse
2. Xeriscaping for Biodiversity Conservation & Habitat Restoration
3. Anaerobic Digester for Biogas Generation
4. Windrow Composting – Japanese “Bokashi” and Indian “Indore” Method
5. Hügelkultur - Raised Garden Beds for Ground Water Conservation
6. Bio-fertilizer and Bio-pesticide Production
7. Green House for Organic Olericulture, and Hydroponics
8. Climate Resilience Organic Farming and Women Empowerment
9. *Jatropha curcas* Linnaeus for Pollution Control and Renewable Energy
10. Office of Sustainability

The vision of green campus initiative at JNV is to transform the school into a model self-sufficient campus. The initiative is carried out through a cooperative effort by collaborating with Pondicherry University researchers and APSCC's strategic green action plan team for campus sustainability. All the initiatives are carefully planned by utilising the locally available resources including the wood from trees that fell due to recent cyclonic activity. The focus is on the campus commitment towards sustainability encompassing social equity, environmental management, and economic prosperity in tune with the principles of Agenda 21 and Millennium Development Goals fostering water, food, energy , climate change and green economy.



Fig 6. Ten Integrated Components of the Green Campus Initiative (Phase I)

Constructed Wetland for Water Reclamation and Reuse

A constructed wetland is a bio filtration system which mimics the natural pond/ lake ecosystems significantly removing a considerable amount of physical, chemical, and biological pollutants from grey water before it seeps into the aquifer or flows into the river, or natural wetland. This will promote a healthier ecosystem and more importantly destroys pathogens, bacteria, and non-biodegradable toxins. Environmentalists have referred to wetlands as nature's kidneys. Native macrophytes such as *Arundo donax* is used as one of the species in the wetland along with *Typha*.



Fig 7. Smt. Dr. Chandra Krishnamurthy, Vice Chancellor, Pondicherry University inaugurating the component – “Constructed Wetland for Water Reclamation and Reuse”

- Horizontal flow Constructed wetlands system for JNV- Puducherry serves as a sustainable solution for water treatment.
- Aesthetically landscaped for backyard areas, providing shade, wildlife habitat and beauty.
- Flowering plants and birdbaths are incorporated into the design to attract butterflies, honey bees, birds and migrants.
- Designed to operate via gravity, without the need for pumps or siphons to dose the wetland with wastewater.

- Native plants such as *Arundo donax* is used as one of the species in the wetland along with *Typha* species.
- Varieties of substrates are used to enhance the pollutant removal process.

A campus typically contains available landscape space, such as a garden, courtyard, and pond. If part of these landscape areas can be used to construct wetlands, campus wastewater would be economically and efficiently treated and reused with not only increasing the landscape and ecology but also serving as a practical environmental lab for the students and faculties. Constructed wetland treatment system therefore becomes a potential exemplar of ecological technology to fit the goals of a sustainable campus.



Xeriscaping for Biodiversity Conservation & Habitat Restoration

Xeriscaping refer to landscaping and gardening in ways that reduce or eliminate the need for supplemental water from irrigation. It originated in Colorado and eventually the idea spread throughout the world to utilize water efficient landscape designs to save water. It is mainly promoted in regions that do not have easily accessible, plentiful, or reliable supplies of fresh water. Here in this project we have integrated xeriscaping with water reclamation.



Fig 8. Shri. M. Dwarakanath, Director, DST&E, Puducherry, inaugurating the component – “Xeriscaping for Biodiversity Conservation & Habitat Restoration”

- It lowers the consumption of ground water
- Less time and work needed for maintenance effort
- With proper planting design, soil grading and mulching, it results in more rainfall retention
- When water restrictions are implemented, by municipality or water costs, xeriscape plants will tend to survive and thrive, while more ornamental plants may be unable to adapt

- Visually appealing than lawns as a portion of xeriscape is dedicated to flowering plants and another portion towards cacti varieties
- Reclaimed water is used, there by reducing the need for fresh water
- Bio pesticide, Bio fertilizer is used to eliminate the need for synthetic alternatives
- Helps in top soil up-gradation and enhancement of soil beneficial micro flora and fauna
- Results in biodiversity conservation and habitat restoration
- Helps in carbon sequestration and mitigate climate change
- Xeriscape-type plants can be employed to attract butterflies, Honey bees, migrants and native species
- Each motivated students contributed a plant for xeriscaping



Kitchen Waste to Biogas: Anaerobic Digester

As part of this project, the “ABCD- Hybrid” (subject to IPR) Biogas Plant, has multiple components such as front end homogenizing reactor; feed holding reactor; cascading phase separated anaerobic digester with the inbuilt mechanical reciprocating device; anti-rotatory floating gas holding reactor; coupled spent slurry inoculator and the rear end spent slurry junction reactor. One installed 7 m³ plant produce biogas substituting approximately 6.2 cylinders per month with the potential reduction in petroleum gas by 10.34 per cent.



Fig 9. Shri E. Vallavan, Chairman, Vidyalaya Management Committee and Director School Education inaugurating the component -“ABCD - Hybrid Anaerobic Biodigester for Biogas Generation”



Fig 10. Mr. Nandhivarnan briefing the special features of the “ABCD Hybrid Plant ” (Anaerobic-antirotatory Bio-baffled Co-coupled Double-digester)

The advantages and environmental benefits of this initiative are as listed below

- Methane production would supplement the petroleum gas by 10-20%.
- Biogas slurry management along with green litters would increase the availability of easily available nutrient rich bio fertilizer.
- Long-term benefits on biodiversity conservation, habitat restoration, campus food security decrease of smell and noxious odor
- 60 – 70% of the microbial load will be minimized during anaerobic digestion
- The pathogenic Salmonella sp. found in the kitchen waste will be eliminated by the ninth day of digestion and the enteric pathogens were eliminated after 2 weeks.
- Typhoid, paratyphoid, cholera and dysentery associated microbes are eliminated in one or two weeks and Hookworm and Bilharzia in three weeks
- Tapeworm and roundworm die completely when the fermented slurry is dried in the sun during composting process
- Cross contamination of soil during monsoon is prevented



Composting for Soil Remediation

The concept of organic farming through compost/ vermicompost is gaining importance world-over to anticipate the increasing and indiscriminate use of synthetic fertilizers and pesticides which resulted in soil fatigue, and gradual deterioration of soil health and productivity. Here as an integrated component of GCI, the biogas spent slurry is mixed with the campus biomass collected by CSS (Community Service Scheme) and NSS (National Service Scheme) students. Two types of composting Indore and Bokashi are practiced. Both have the similar features except for the inoculums.



Fig 11. Dr. S. Varalakshmi, Principal, Bharathidhasan Womens College, inaugurating the component - "Composting for Soil Remediation"

The features and environmental benefits of composting includes.

- Improves soil porosity, balances pH, attracts and feeds earthworms
- Increase soil fertility and soil health by increasing organic matter in soils
- Increase water holding capacity of soil and in clay soils, it improves draining by making it more airy
- Improve soil biodiversity and reduces plant stress from drought
- Support vigorous growth of

beneficial micro flora and fauna thereby increasing productivity

- Rich source of easily available plant nutrients including trace elements
- Decreased pesticide residues, weed seeds, heavy metals
- Bioremediation of the degraded land create better environment, reducing ecological risk
- Supports vigorous growth of beneficial micro flora and fauna thereby increasing productivity
- Reduction of plant root and shoot diseases, etc.



Hügelkultur - Raised Garden Beds

Since Peninsular India is prone to frequent cyclones and storms, a large number of trees fell during such disasters. Much of these trees fell due to poor anchoring root system and they are left to rot without any use. On December 29, 2011, when the cyclone Thane hit the land, a large number of trees fell in Puducherry including the JNV campus. To utilize them effectively, we adopted the German concept of “Hügelkultur” as one of the component. It is a practice of making raised garden beds filled with rotting wood. It is in effect creating a “Nurse log”, a fallen tree which, as it decays, provides ecological facilitation to seedlings. Benefits of hügelkultur garden beds include water retention and warming of soil. Buried wood becomes like a sponge as it decomposes, able to capture water and store it for later use by crops planted on top of the hügelkultur bed. The buried decomposing wood will also give off heat, as all compost does, for several years like forest floor.



Fig 12. Mr. Nandhivarman briefing the concept of Hügelkultur and the effect it has on the adjacent tree cover over a period of time

Anchoring roots spread to where soil conditions provide nutrients and moisture, which is usually near the surface. About 85 % of tree roots are within the top 500mm of soil. The trees are uprooted because of poor and instable anchorage roots, which is the result of lack of moisture in the top soil. The eastern coastal belt of Peninsular India has witnessed this because of Thane which uprooted up to 70 per cent of trees in some areas. The fertile top soil alone has the ability to retain the moisture through the group of micro biota which will sustain the health of the roots.



Biofertilizer production is through vermicomposting, which refers to composting of biodegradable organic waste into high quality nutrient rich manure with the help of indigenous earthworms. They provide unseen ecosystem services by serving as versatile natural bioreactors to harness energy and destroy soil pathogens, even assimilating heavy

metals during their life cycle. The driving forces and the global recognition behind the vermiculture for vermicomposting is to recover organic material and to return this back to the field for maintaining the natural cycle of the recycling process.



Fig 13. Smt. Dr. Anisa B. Khan, Dean, School of Life Sciences, Pondicherry University inaugurating the component - “Biofertilizer and Biopesticide”

Vermicompost contains high concentration of organic material, silt, clay and is rich in many soil nutrients such as nitrogen, sulphur, potash, phosphorus, calcium, magnesium, etc. Vermicompost contain nutrients in forms that are readily taken up by the plants such

as nitrates, exchangeable phosphorus, and soluble potassium, calcium, and magnesium.

Panchagavya is an organic plant liquid fertilizer and pesticide and it means the blend of five products obtained from cow. It is also a traditional method, used to safeguard plants and soil micro-organisms and to increase plant production. Its application cures infested plants of diseases and increases the immunity of the plants and other organisms in the ecosystem.

It sustains drought conditions and also increases the yield. It activates the photosynthetic system for enhanced biological efficiency, enabling synthesis of maximum metabolites and photosynthates. It also contributes to less irrigation and ensure drought hardiness by forming a thin oily film on leaves and stem, thus reducing evaporation.



Green House for Organic Olericulture and Hydroponics

Greenhouse cultivation is evolved to create favorable micro-climates, which favors the crop production, possible throughout the year. Horticulture is the science, technology, and business involved in intensive plant cultivation for human use.



Fig 14. Prof. N. Parthasarathy, HOD, Department of Ecology and Environmental Sciences, Pondicherry University inaugurating the component- "Green House for Organic Olericulture and Hydroponics"

Greenhouses for horticulture allow for greater control over the growing environment of plants. Some of the key factors which may be controlled include temperature, levels of light and shade, irrigation, fertilizer application, and atmospheric humidity. Greenhouses may be used to overcome shortcomings in the growing qualities of a piece of land, such as a short growing season or poor light levels, and they can thereby improve food production in marginal environments.

The relatively closed environment of a greenhouse has its own unique management requirements, compared with outdoor production. As a component of GCI, the plants are cultivated through application of biofertilizers and biopesticide resulting in 100% organic produce. Hydroponics is a subset of hydroculture and is a method of growing plants using mineral nutrient solutions, in water, without soil. When the required mineral nutrients are introduced into a plant's water supply artificially, soil is no longer required for the plant to thrive.

Olericulture is the science of vegetable growing, dealing with the culture of non-woody (herbaceous) plants for food. It involves the production of plants for edible use and encompasses crop establishment, including cultivar selection, seedbed preparation and establishment of vegetable crops by seed and transplants. The motivated students have contributed each one pot for green house Olericulture.



Organic Farming and Women Empowerment

“Organic agriculture is a production system that sustains the health of soil, ecosystems and people. It relies on ecological processes, biodiversity and natural cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved” - International Federation of Organic Agriculture Movements



Fig 15. Smt. Dr. Chandra Krishnamurthy, Vice Chancellor, Pondicherry University, with the girl students who ventured into climate resilient campus organic farming for sustainable development

In the study of ecology, resilience is the capacity of an ecosystem to respond to a disturbance by resisting damage caused through stochastic events such as fires, flooding, windstorms, insect population explosions, anthropogenic activities and recovering quickly. Resilience is a dynamic process highly influenced by protective factors, which are specific competencies that are necessary for the process of resilience to occur. Competencies here are the healthy

skills and abilities of the individual which can be accessed within the individual or interpersonal or family environment. Since JNV has these healthy skills and abilities, we have integrated organic farming with women empowerment in this Green Campus Initiative as an interdisciplinary discourse on resilience, considering interactions of humans and ecosystems to build ecological resilience through "adaptive resource management and campus governance".

Organic and sustainable farming has the potential to create new structures that actively work towards achieving women's empowerment and protecting the use of indigenous knowledge. The girls and women who actively participate in this project will maintain important traditional knowledge including indigenous plants, their health benefits, traditional food and handicraft crops which helps boost not only the healthy family living but also green economy.



JCL and Pollution Control

The National Planning Commission's integrated "National Mission" and mass movement program wants to mobilize a large number of stakeholders including individuals,



Fig 16. Smt. Dr. Chandra Krishnamurthy, Vice Chancellor, Pondicherry University, inaugurating the component - "Jatropha for Renewable energy and Pollution control" along with Prof. Dr. G. Poyyamoli

communities, businesses, entrepreneurs, oil companies, industry, the financial sector as well as Government and most of its institutions to cultivate *Jatropha curcas* Linnaeus (JCL) for the production of "biodiesel", with a industrial value added byproducts like - glycerin, pesticide, press cake, and carbonized briquette. Researchers and scientists conclude that energy crops will have high water footprint and should neither be irrigated with

fresh water nor be planted near water bodies. Hence, in this Green Campus Initiative we integrate this with grey water treatment and reuse. The advantages and environmental benefits of growing energy crops includes:

- Erosion control, hedge plant, medicinal uses, plant protectant, monkey repellent, fire wood, green manure, combustibles
- Waste water/ reclaimed water generated within the JNV campus is redirected for use in the *Jatropha* cultivation
- Reduces the waste water load on municipal treatment system and helps close the water cycle
- The carbonized briquette are non-conventional source of energy, renewable in nature, ecofriendly, non-polluting & economical
- Glycerine can be used for the manufacture of industrial soaps
- Easily adapted and can be cultivated on lands adjacent to sewer systems which are not suitable for food crops.
- Reduces the quantity of waste water discharged into the sea, Bay of Bengal.



Office of Sustainability

The office of sustainability at JNV coordinated with APSCC, informs, inspires and engages the faculty, students, staffs and also the community in a voluntary, self-guided initiative that promotes best environmental practices in the campus and the surrounding environment. The office coordinates and supports initiatives that helps reduce the campus's ecological footprint.



The office of sustainability at JNV helps;

- Engage the campus community in activities that will strengthen the Jawahar Navodaya Vidyalaya, Puducherry campus position as a leader in Green Schools

- Foster experimental education and further integrate sustainability into the campus culture

- Facilitate programs and initiatives related to campus environmental sustainability

- Educate participants and visitors about how and why to take such initiatives

- Undertake environment related site visits to educate students on various options available for sustainable way of living



Fig 17. Smt. Dr. Chandra Krishnamurthy, Vice Chancellor, Pondicherry University and Mr. E. Vallavan, Director, School Education inaugurating the "Office of Sustainability"

Environmental field visits organised by the office of Sustainability



Students learning the process of water pollution control through a series of pilot scale constructed wetland



Students gaining hands on technique about biogas from a residential level 0.5 m3 biogas plant at Oulgaret Municipality, Puducherry



Knowledge transfer on the Biogas to Energy converting hybrid engine



Understanding the Characterization and Segregation process of Municipal Solid Waste



Plastic pelleting machine to sustainably manage MSW (Plastics) for recycling



Capacity building workshop about the state of the art biogas technology at municipal level 100m3 plant, at Mahaballipuram, Tamilnadu



Learning the process of conversion of biogas spent slurry to Vermicompost



Investigation and study on the biogas spent slurry storage

This initiative at JNV is blessed with cooperation of the management, teaching/ non teaching staffs, NSS/ CSS students and volunteers, who played a vital role along with APSCC from meticulous planning till successful implementation, within 100 working days thereby paving the way for action research, development and dissemination for the rest of the years to come. Globally, several eminent scientists and professionals are constantly warning the



Fig 18. Smt. Dr. Chandra Krishnamurthy, Vice Chancellor, Pondicherry University with Mrs. Golda A Edwin, the founder of the “Green Campus Initiative Cooperative Movement”

Governments about the possible crisis the “Perfect Storm” by 2030, where “a whole series of events come together” like rise in world's population by 33% triggering the demand for food by 50%, water by 30%, energy by 50% coupled with manifold multiple disasters. These challenges ahead, affect every person on this planet and to be prepared to meet such inevitable challenges, we believe the “Green Campus Initiative Co-

operative Movement” will not only empower the student and staff community to make sustainable decisions but also have a profound positive impact to their surrounding communities as a result of the outreach activities and prepare the present generation to face such unpredictable and unprecedented disasters that are bound to come.

Acknowledgements

We would like to express our gratitude to all those who assisted in completing this project. We thank Dr. G. Poyyamoli, Associate Prof. Department for Ecology and Environmental Sciences, Pondicherry University for his constant encouragement for practical implementation. We thank the Principal, Teaching and Non Teaching Staffs of Jawahar Navodaya Vidyalaya, Puducherry for their immense support, encouragement and cooperation for this initiative. We also would like to thank the student teams' especially 11th standard commerce 2012 batch and science students along with NSS/ CSS volunteers for their tremendous hard work and cooperation in successfully implementing the projects, thereby paving the way for the research, development and dissemination of knowledge for the rest of the years to come. We also thank the project coordinators Mr. S. Bhaskaran and Mr. M. Nakkeeran from APSCC who assisted in the planning, design, documentation, and implementation work.

Special thanks to following persons who graced the inauguration of the "Green Campus Initiative" and provided encouragement and support to the students, researchers, staff members and communities to take up more such initiatives and set an example.

- Smt. Dr. Chandra Krishnamurthy, Vice Chancellor, Pondicherry University
- Shri. Pankaj Kumar Jha, Additional Secretary (Home) and Project Director REAP, Puducherry
- Shri. M. Dwarakanath Director, DST&E (MoEF) Puducherry, Member Secretary PCC/ PCS&T/PCZMA
- Shri Dr. V. Muthu Founder Chairman, Pallavan Group of Educational Institutions
- Shri. M. Dhanasekar Founder Chairman, Manakulavinayakar Group of Institutions
- Smt. Dr. S. Varalakshmi Principal, Bharathidasan Govt. College for Women, Puducherry
- Smt. Dr. Anisa B. Khan, Dean, School of Life Sciences, Pondicherry University
- Shri. Dr. N. Parthasarathy, HOD, Dept of Ecology & Environmental Sciences, Pondicherry University
- Shri. Dr. G. Poyyamoli, Department of Ecology & Environmental Sciences, Pondicherry University
- Shri. Dr. R. Arunprasath, Center for Green Energy Technology, Pondicherry University

