Rural Training Center-Thailand S.O.I.L. Technical Paper

Funding Farmers for Climate Change Mitigation (F^2C^2M) Program

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Community-based environmental education for the self-sufficiency and sustainability of small rural family farms

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A Draft Proposal for Climate CoLab Land & Agriculture

Abstract

Agriculturalists are significant contributors to green house gas emissions. For most impoverished small rural family farmers, climate change issues are either beyond their awareness, comprehension, or perceived scope of action. Individually, many feel they are too small to matter. This proposal is to put a financial value to small rural farmers' sustainable agricultural practices to reduce green house gas emissions and local environmental degradation. The cost savings to governments should be used to provide small rural farmers with access to micro-credit as an incentive to sustain the effort implement, maintain, and promote the use of sustainable agricultural practices among more small rural farmers. This can lead to other positive benefits such as protecting forests, watersheds, and local biodiversity; food security for the rural poor, increase local food production, reduced dependence on fossil fuels and related resources, rural economic development, and restoring rural communities. [Note: Agriculture, as used in this paper, refers to primary production of plant and animal food materials on the land.]

F^2C^2M Basic Overview

Funding for Farmers for Climate Change Mitigation (F^2C^2M) is a project to support the first tier of the Thai King's Theory of the Sufficiency Economy with the added emphasis on climate change mitigation. In many developing or underdeveloped countries, the majority of people come from rural agrarian backgrounds. Rural poverty causes a rural to urban migration as people seek to earn money in cities. While some find employment in emerging factories, economic down turns often results in mass unemployment. This occurred in Thailand in 1997. Many displaced workers were able to retreat to rural family farms to weather out the storm. Small rural family farms helped make the Thai economy more resilient.

In addition to providing economic resilience, we believe small rural family farms are an untapped and undervalued national resource. This proposal strives to include and empower the many small rural family farmers of the world become a significant and potent global force using access to a micro-credit incentive program to:

- reduce green house gas emissions and environmental degradation by using sustainable agricultural practices (S.A.P.)
- reduce deforestation (especially in the quest for more farm land)
- reduce soil erosion and improve soil conditions with minimal use of synthetic agrochemicals
- protect native pollinators and local bio-diversity
- reduce agricultural water consumption / increase on-farm water resources
- reduce agricultural fossil fuel consumption
- encourage sustainable off-the-grid energy use

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- increase sustainable agricultural productivity to fight world hunger and starvation
- reduce the number of impoverished small rural farm families
- improve the quality of life for the rural poor (and thereby in rural communities)
- make education a life-long process of the local culture

These can be accomplished in a series of steps.

Step 1: Inventory current local agricultural practices (traditional and recognized / proven sustainable practices) in an area relative to green house gas emissions and / or related local environmental degradation issues. This includes input from local farmers, government, and other interested groups. This inclusive and comprehensive view should help to clearly define the local problems in regional, national and global contexts. (It is anticipated that some of these complex issues involve geo-politics and other historical / cultural issues. However, the main idea is to give priority to the agricultural and environmental issues related to green house gas emissions and related environmental degradation.)

Step 2: Quantify the negative and positive effects of each item in the inventory. Sustainable agricultural practices (S.A.P.) are given positive "points" relative to their proven ability to reduce green house gas emissions or reduce local environmental degradation. Rural farmers need to be made aware of these long-term benefits. These data will be used to create a set of weighting factors to help assess / approve micro-credit applications. Access to micro-credits linked to S.A.P. is an incentive for farmers to use S.A.P. The assumption is that increasing S.A.P. in a local area leads to long-term local agricultural and community viability. Farmer's choosing to implement S.A.P. makes them be part of the solution to global climate change and combating global hunger.

Step 3: Monetize the negative and positive effects of each item in the inventory. This assumes two basic ideas: 1) negative practices result in "direct and indirect costs" to society, and 2) positive practices result in "direct and indirect savings" (lower costs to remedy the negatives) for society. Funds resulting from savings to society would be used to fund the F^2C^2M program. Our assumption is no country has unlimited to funds. Reallocating funds is feasible IF it can be shown using S.A.P. in an area reduces costs. The allocation of the savings to fund the F^2C^2M micro-credit program encourages farmers to adopt and continue to use S.A.P... This in turn helps to reinforce the positive benefits of S.A.P.

Step 4. Create the F^2C^2M micro-credit program following the model of the Grameen Bank (with the some notable differences). (FFI: http://www.grameen-info.org/index.php?option=com_content&task=view&id=19&Itemid=114). First, loan application assessment scoring includes weighting factors based on S.A.P. used by the loan applicant pertinent to reducing green house gas emissions and local environmental degradation. Interest rates could also be linked to S.A.P. usage (e.g. lower rates for increased uses of various S.A.P. methods).

For example: Many small rural farmers use fire to clear new land or to prepare fields for planting. Various cultures do this for different reasons and beliefs. However, the resulting green house gas emissions and air pollution create "costs" to the rest of society. In the case of air pollution, direct costs are incurred for medical care of those with respiratory illness. If local farmers did not burn to prepare their fields for planting,

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this reduces air pollution and therefore related medical costs. The medical costs savings would be used to fund the F^2C^2M micro-credit program. If farmers did not burn the clear more land, this might reduce deforestation (and related landslides, mudslides, and flooding). The disaster relief costs savings should be put into the F2C2M micro-credit farm program.

When farmers apply for F^2C^2M micro-credit loans, their applications are assessed relative their use of S.A.P. germane to their local environmental conditions. We assume the use S.A.P. will improve their farm yields. This in turn gives the family 1) food security; 2) possibly a surplus which they can use for barter or sale to improve their quality of life; 3) produce surplus food that can move into the local, regional, or national food supply.

Education plays a key role in the F^2C^2M project. People need to learn about S.A.P. In some cases, the S.A.P. may differ from their traditional practices. Resistance to change is common and is to be expected. The carrot in F^2C^2M is the access micro-credit loans.

Overcoming resistance to change is accomplished with teaching and teach-backs. Teaching is done by example. Small demonstration plots are planted side-by-side comparison / contrast S.A.P. to local traditional methods. This is a common practice in agricultural experimentation and research. Then local farmer see the benefits of S.A.P. methods in their own local area with familiar crops and conditions.

Teaching is most effective when students WANT to learn. Small farmers need to be encouraged to “self-select” (volunteer) for the training. We believe many will self-select when they see S.A.P. methods give higher and better quality yields than their traditional methods. It only takes one local success to get others to consider changing from old to new methods.

With low education and literacy in rural areas, the use of Teach Backs avoids the need for written exams. Anyone trained in S.A.P. shares their knowledge with others. Each trainee is obligated to teach back to 5 individuals who are not trained in S.A.P. The repeated sharing of knowledge helps develop proficiency and familiarity with S.A.P. Mastery will be self-evident in the improvement of the farm.

Access to the F^2C^2M micro-credit program is the carrot to encourage farmers to learn and try S.A.P. The “ticket” for the application consists of:

- S.A.P. training certificates (relevant to the local environmental conditions). S.A.P. would be clustered to deal with local terrain / crop conditions. For example, in tropical hilly areas, composting and S.A.L.T. (Sloping Agricultural Land Techniques) might be the minimum required certificates.
- Verified “teach back” of S.A.P. to at least 5 farmers who lack S.A.P. certificates. It goes without saying the S.A.P. must match the conditions on a person’s farm. This helps assure the training will most likely be utilized.
- Verified implementation of S.A.P. on their farm or the land which they farm. S.A.P. trainers need to do follow-ups to provide accountability that trainees actually implement S.A.P. on the farm. The actual trainers needs to be determined, but should be local people. In addition to verification, the monitors should be prepared to mentor and nurture the S.A.P. farmers.

The F^2C^2M micro-credit application process can begin at any point after a farmer gets an S.A.P. certificate. Obviously, the more certificates the better. And the further

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along the process (e.g. completing the Teach Back requirement and implementing S.A.P.) the better the chances of approval due to earning more favorable weighting factors.

Note: No one gets a free ride. Funds are not disbursed gratis. Micro-loans must be repaid in full, with interest. The S.A.P. weighting factors should be treated as an "in kind" match to help offset some of the collateral requirements for the loan or determining a lower interest rate.

Assumptions:

- Rural farmers may lack formal education but they possess local knowledge and wisdom which may be unknown to outside experts.
- Given an opportunity to learn, some rural farmers may be quick to learn new methods and be better equipped to adapt new methods to local conditions than outside consulting "experts".
- People in poverty are not poor because they don't have money. They are poor and continue to be poor due to lack of education and opportunity to be empowered to change their lives.
- People in poverty are confronted with immediate short-term challenges that preclude them from being aware of and effectively dealing with long-term issues.
- Small rural farmers are a valuable asset and resource to alleviate world hunger by first feeding themselves and then supplying local markets with local produce. World hunger will not be alleviated by importing food from distance sources.
- The shorter the distance from farm to table the less energy needed to transport it to market. This reduces dependence of fossil fuels and helps reduce green house gas emissions.
- The farther a rural farm is from a town or city (presumably a base for government services), the longer it will take for government assistance to arrive and the less frequent the contact. Forming S.A.P. learning groups and teams helps overcome this challenges and helps maintain momentum in S.A.P. learning and implementation. (In the RTC-TH, we say "It is better to network than to not work".)
- Using "off-the-shelf" proven and effective sustainable agricultural practices (S.A.P.) prevents "re-inventing the wheel" and speeds implementation of programs to reduce agricultural green house gas emissions and local environmental degradation.
- Integrating national agricultural policies and practices with relevant private sector and non-governmental organizations can help speed the education and training of "off-the-shelf" proven and effective S.A.P. methods.
- People learn best when they choose to learn rather than being required to learn.
- Creating access to a micro-credit system for farmers linked to reduce green house gas emissions and local environmental degradation gives farmers the incentive to overcome cultural inertia of resistance to accept S.A.P. methods.

Scaling Up: The Training of Farmers

Additional F^2C^2M micro-credit assessment factors for can also be added when scaling up this program. Teach Backs are the prime mechanism for scaling up. For

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example, additional multipliers could be created. For example, after teaching back (training) S.A.P. to 5 other farmers, an individual farmer (a Seedling) can:

- Join a group of 5 farmers trained in S.A.P. to form a team (a Sapling) to implement S.A.P. on their farms. They form a mutual support team to reinforce and continue learning and to adapt S.A.P. locally. Activities range training individual farmers and promoting other team start-ups.
- A group of 5 teams (Saplings) forms a village group (a Nursery) implement S.A.P. In addition to the activities of the previous level, Nursery activities include to creating or expanding village markets and forming cooperatives to market to bigger buyers in nearby towns or cities.
- A group of 5 neighboring villages in a district or county (a Grove) implement S.A.P. In addition to activities of the two previous levels, Grove activities include creating or expanding district level markets and expand cooperative marketing efforts within the district between village cooperatives.
- a group of 5 neighboring districts or counties (a Woodland) implement S.A.P. Woodland activities focus on coordinating districts level markets and support expanding village cooperatives marketing efforts at a regional to national level. At this stage, the small rural farmers are effectively integrated into the system where national government agencies and large companies / corporations handle the farm produce from the rural areas.

Notes:

1. The number “5” is based on the teachings of Sun Tzu pertaining to the effective communications in large organizations.
2. Each level of involvement uses Teach Backs to try to replicate a unit at the same level and may strive prepare for the next level. At the start, an individual teaches back to 5 individuals. A team teaches back to groups of individuals who potentially would form a team of 5 individuals. Each team has goal to help form 5 teams. The pattern continues upward through all levels. This model promotes building a sense of community among the S.A.P. farmers, villages, districts, and in the nation.
3. When seeking individuals to learn S.A.P. care should be taken to form the core group in a new area. Core team members should possess the following characteristics: A) Be a respected member of their community; B) Have an open mind, willing to learn new ideas and try new methods; C) Be willing to freely share their knowledge with others and not to personally profit by hording the information; D) Are known for taking action, not being afraid to fail and to be willing to learn from their mistakes; E) be nurturing to others in their community; F) Be able to see the big picture and think long-term; G) think of the good of the community.
4. When forming groups at all levels, care should be taken to recruit group members based on common denominators relevant to particular S.A.P. methods. In other words, mountain villages may be a better in a group than mixing mountain, coastal, and flood plain villages. Linguistics and culture should be considered so the group members can more easily share training and experiences. Geography is also a factor in that the villages should be within easy access to facilitate exchange and communications. Amateur radio could be used if distance became an issue.
5. The nation’s diversity of landscapes, climates, and cultures builds a national S.A.P. database. The creation, maintenance, and sharing of this database could be a

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factor used by international financial organizations in their program requirements. Care should be taken at the outset to "encode" groups consistent with geo-coding methods to permit integrating all F^2C^2M program data for GIS (Geographic Information Systems) use.

Scaling Up S.A.P. and Rural Enterprise Related Education

This segment of the F^2C^2M program creates an education model integrating schools, government agencies, and local businesses. Schools provide the academic and vocational education using students organized into multi-disciplinary teams to complete an S.A.P. related local community service project. Government agencies provide guest speakers and materials to make the students aware of relevant policies and programs. Local businesses provide similar resources (e.g. speakers and materials) and possible internship opportunities. Funding can be a combination of matches from school budgets, government agency budgets for training and outreach. Businesses would be encouraged to donate cash or in-kind matches. [**Note:** It may be possible to set up an F^2C^2M micro-credit category to help fund S.A.P. education collaborative.]

School Room Training
Primary (Elementary) Schools

- **Integrate S.A.P. as applied school lessons** to expose students to multi-disciplinary learning models. This focus is to present real-world examples of using math, science, language, and technology. Hands-on, interactive learning with teach backs are used rather than the traditional lecture / written test approach. The school garden can be used to show side-by-side comparison / contrast of S.A.P. garden plots to traditional plots.
- **Make community service projects** an integral part of the school curriculum. Students work on a community project related to S.A.P. as a demonstration of the effectiveness of the methods. For example, students help create and maintain a garden for elderly/infirm/needy community members who have limited means. The produce helps support these community members and imparts a sense of community, compassion, and social responsibility to the students.

Secondary & Post-Secondary Schools

- **Integrate S.A.P. with Secondary & Post-secondary education** with an eye toward developing small rural enterprises. For example, a school organizes a community service project team to make SRI weeding tools. The team might consist of students studying business, mechanics, metal crafting, agriculture, and education. Relevant government officials and business members can be guest speakers. They could make students aware of relevant government policies and programs. Bankers could talk about local financial resources and programs.

  The students work together. Each "specialist" contributes their "expertise" but is exposed to the needs / issues of the other specialists. This fosters "seeing the big picture", learning about "trade-offs" and compromises, and working in a multi-disciplinary environment. This is realistic job readiness training.
- **Use community-service projects** to integrate schools to communities with an eye toward diffusing education and technology to the community. This can be done by taking the project mentioned above to involve local villagers (non-students). The school and a village (or group of villages) might engage in a

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matching agreement to support the project. The integrated student team pairs up with village members of similar interests / expertise. The goal is to implement the project in the village with students as the teachers. The students "teach back" to the villagers to verify and validate their education. The teachers monitor / nurture (mentor) the students but do not actually do the teaching. There should be periodic follow-ups to assess the project. This approach gives students real world experience and potential job contacts. Some students might return to their home villages after graduating and start a business. The villagers gain education / training not often available to them. The school does community outreach giving them an opportunity to recruit students / teachers, and to be relevant to the local community.

Scaling Up: F^2C^2M Funding Sources

The initial funds for the F^2C^2M micro-credit comes through international, government and private financial organizations and private sector businesses and NGOs.

- **Primary Sources:** The World Bank, International Monetary Fund, United Nations, and Asian Development Bank (among others) could include the establishment of an F^2C^2M micro-credit program as part of their funds distribution / aid plans to nations. This should be on a matching basis. The international funds match the national government budget cost savings realized by farmers implementing S.A.P. For poorer nations, options for "in-kind" match and / or "sweat equity" should be created to give them access to the program.
- **Secondary Sources**: Private Banks may want to tap into the micro-credit program as a matter of common business practice or due to government subsidies. Private sector businesses, (e.g. insurance companies) may realize cost savings due to lower claim filings as a result of S.A.P. They would be encouraged to donate a portion of their cost savings the F^2C^2M micro-credit program as an investment to reduce future loss payments.
- **Tertiary Sources**: Many NGOs are already involved in teaching and using S.A.P. They would be encouraged to participate to help qualify farmers for the F^2C^2M micro-credit program. This reduces the costs for governments to educate and train farmers in S.A.P. That cost savings could be added to funds for the F^2C^2M micro-credit program.

  Another potential source of funding might be the rural enterprises created by the educational programs under the F^2C^2M program. Perhaps some proceeds from the businesses could be donated to support the program. In-kind opportunities could also be counted (e.g. internships, hiring preferences for S.A.P. trained graduates, or educational scholarships for local students from the village of the business owner).

Note: A national database of S.A.P. could serve as a clearing house to assure a better fit of local needs to education and training resources. It could be used to optimize collaboration and prevent duplication of effort and promote the efficient allocation of resources.

An Example: Burning to Clear Land

It is a common practice for people to burn vegetative matter to clear land for agriculture. (See the NASA Earth Observatory "Global Fire Map"

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http://earthobservatory.nasa.gov/GlobalMaps/view.php?d1=MOD14A1_M_FIRE). Deforestation is a common scenario to clear land for farming. This occurs often in northern Thailand (and elsewhere). Once the trees are cut down, the unused residues are often burned. Existing fields are burned to prepare the land for planting. All burning increases green house gas emissions and air pollution.

Benefits to the Locals	Costs to Society
• Labor saving: This is a quick and easy way to dispose of the plant residues. • Improve soil fertility: Some people also believe they are producing soil nutrients. Studies show burning does give a fast addition of P to the soil. • Food Security and Income: More land to grow crops to feed the family and to earn income	• Deforestation: Loss of carbon sequestration, oxygen production, habitat, bio-diversity, some forest food resources. Increased soil erosion (reducing agricultural productivity), landslides, mudslides, flooding, and siltation (increase disaster relief costs, infrastructure repairs and maintenance, and insurance loss payments). • Burning: Increased green house gas emissions (counter to government commitment to reduce these), air pollution (increase health care costs), reduced visibility (flight delays and cancellations, lower tourist visitations and income for tourism related jobs)

Notes:

1. Farming / farmers, farms, and crops are not the same in all places. A specific S.A.P. method is not suitable for all farmers, farms, and crops in all places. S.A.P. methods may require adaptation to the climate, soils, topography, and culture of a place.
2. It all begins with the local people and conditions. Local farmers ***must be included*** in assessing and adapting S.A.P. methods for their locale. Whenever possible, local traditional methods should be incorporated or adapted to incorporate proven effective S.A.P. methods. In some cases, traditional methods may need to be resurrected or re-learned. Education begins with the familiar, adds new knowledge and insights, to deal with the changes and the unknown.
3. Many times, short-term issues take priority over long-term consequences. Hunger and starvation are immediate needs that cannot await a hoped for future crop. "New" or different methods may need to be phased in to assure continuity in local food supplies. Positive change and success will not happen overnight. It certainly almost never seems to happen as quickly as failure. Success can come out of failure IF we learn from the mistakes and try again.

Some Possible Sustainable Agricultural Practices for F^2C^2M

Disclaimer: *The reference of any particular group or organization in the table below is provided as an example of an established S.A.P. based on our personal awareness. It does not indicate that organization's endorsement of the* F^2C^2M *project nor is it an "official" (or our personal) recommendation. The mention of a group or organization in this table should not limit the list of possible S.A.P. methods used in the* F^2C^2M *program. There may be many similar groups, organizations, and practices in existence. Items lacking a referenced example are deemed to be commonly known and readily accessible sources.*

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Desired Outcome	S.A.P. Action
Reduce green house gas emissions and environmental degradation by using sustainable agricultural practices (S.A.P.)	• Stop burning (to clear land, dispose of trash); • Reduce use of synthetic chemical fertilizers — mulch and compost instead. • Use "rocket stoves" or similar clean burning wood / charcoal stoves (FFI: http://www.rocketstove.org/) • Use solar cooking (FFI: https://www.solarcookers.org/)) • Grow wet rice using SRI (System of Rice Intensification) (FFI: http://sri.ciifad.cornell.edu/aboutsri/FAQs.html) • Use bio-gas digesters for human, animal, and kitchen organic "wastes" to get cooking gas and compost (turning "wastes" into resources).
Reduce deforestation (especially in the quest for more farm land)	• Improve soil of existing farm land rather than clear forest to get more land. • Use "Natural Farming" in forests (e.g. Fukuoka's and similar Japanese methods) (FFI: http://www.onestrawrevolution.net/One_Straw_Revolution/One-Straw_Revolution.html)
reduce soil erosion and improve soil conditions with minimal use of synthetic agrochemicals	• Do not clear forested land; Plant trees • Protect all bare soil (especially on slopes) from raindrops using mulch or cover crops • Use compost and EM (effective micro-organisms) or IM (indigenous micro-organisms) to increase soil biota (earthworms and other organisms inhabiting the top soil) (FFI: EM http://www.effectivemicro-organisms.co.uk/; IM http://www.ctahr.hawaii.edu/oc/freepubs/pdf/BIO-9.pdf) • Reducing use of synthetic agrochemicals also reduces the use of petro-chemicals / fossil fuels and oil imports • Use SALT (Sloping Agriculture Land Technique), no till / low till methods on sloping land. (FFI: http://www.fao.org/ag/AGP/AGPC/doc/publicat/gutt-shel/x5556e0y.htm) • Steep slopes should be used for grazing and planting trees with multiple purposes (e.g. water shed / soil erosion protection, soil enrichment, animal feed, fruits/nuts/leaves for food, trimmings for fire wood) • Nutrient re-cycling on the farm using Biologically Integrated Farming Systems (BIFS) methods (FFI: http://www.sarep.ucdavis.edu/sfr/bifs) • Check dams, planted flow paths, terracing, and swales to slow surface water flow and increase time for water to infiltrate the soil.
protect native pollinators and local bio-diversity	• Do not clear forested land • Use native plants to promote attracting indigenous beneficial insects • Use IPM (Integrated Pest Management) with little or no synthetic pesticides (FFI: http://thailand.ipm-info.org/ • Use companion planting methods based on local native species (FFI: http://www.gardening.cornell.edu/factsheets/ecogardening/complant.html) • Use inter-cropping and not mono-culture / crop planting (FFI: http://www.agriinfo.in/?page=topic&superid=1&topicid=492)
reduce agricultural water consumption	• Use micro-drip irrigation (FFI: http://www.ideorg.org/ourtechnologies/dripirrigation.aspx) • Use Humanure toilets (FFI: _https://humanurehandbook.com/instructions.html). Making these toilets could become a rural enterprise activity. • Grow wet rice using SRI (System of Rice Intensification) which can save up to 75% of water used in more traditional methods (FFI: http://sri.ciifad.cornell.edu/aboutsri/FAQs.html) SRI alternates wet / dry periods for watering traditional wet paddy rice. (FFI: http://agri.puducherry.gov.in/awd.htm) Local manufacturing of weeding tools could create rural cottage industries for jobs and business development. (FFI: http://www.slideshare.net/SRI.CORNELL/0896-weeders-for-use-with-sri-alternative-designs-to-save-labor-time-and-energy)

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Desired Outcome	S.A.P. Action	
reduce agricultural water consumption	• Use micro-drip irrigation (FFI: http://www.ideorg.org/ourtechnologies/dripirrigation.aspx) • Use Humanure toilets (FFI: _https://humanurehandbook.com/instructions.html). Making these toilets could become a rural enterprise activity. • Grow wet rice using SRI (System of Rice Intensification) which can save up to 75% of water used in more traditional methods (FFI: http://sri.ciifad.cornell.edu/aboutsri/FAQs.html) SRI alternates wet / dry periods for watering traditional wet paddy rice. (FFI: http://agri.puducherry.gov.in/awd.htm) Local manufacturing of weeding tools could create rural cottage industries for jobs and business development. (FFI: http://www.slideshare.net/SRI.CORNELL/0896-weeders-for-use-with-sri-alternative-designs-to-save-labor-time-and-energy)	
increase on-farm water resources	• Increase soil moisture retention by increasing soil organic content (e.g. mulching, composting, earthworms, EM / IM (effective micro-organisms / indigenous micro-organisms) (FFI: EM http://www.effectivemicro-organisms.co.uk/; IM http://www.ctahr.hawaii.edu/oc/freepubs/pdf/BIO-9.pdf))	
	• Harvest rainwater; make fish ponds to increase on-farm water resources (FFI: http://www.rainwaterharvesting.org/) • Trench / Infiltration Soil Water storage (FFI: http://www.ctahr.hawaii.edu/hawaiirain/Library/papers/Mechell_Justin.pdf)	Constructing rainwater storage facilities could be a source of employment. Construction teams could be created as a form of rural economic development.
reduce agricultural fossil fuel consumption	• Minimize the use of internal combustion engines using fossil fuels • Use machinery powered by non-food vegetable oils (e.g. *Jatropha curcas*) and renewable alternative energy sources (and plant renewable energy crops on land unsuitable for food production or on rights-of-way unused for food production). • Form local farmer co-operatives to share transportation or to have buyers come to you • Sell produce locally to keep transport distances short • Minimize off-farm expenditures (esp. for goods that must be transported into your area). • Buy locally to avoid indirect transportation costs and fuel consumption.	
encourage sustainable off-the-grid energy use	• Use alternative renewal energy as much as possible • Use passive solar systems to “heat”, “dry”, and “cool” • Some alternative renewable energy equipment may be suitable for local manufacture (e.g. ram pumps, FFI: http://www.clemson.edu/irrig/equip/ram.htm) • Local manufacturing to support SRI and following the IDE model could lead to rural economic development in non-farm jobs (FFI: SRI http://www.slideshare.net/SRI.CORNELL/0896-weeders-for-use-with-sri-alternative-designs-to-save-labor-time-and-energy; IDE http://www.ideorg.org/OurTechnologies/TreadlePump.aspx)	
increase sustainable agricultural productivity to fight world hunger and starvation	• Use rock dust (http://www.carbon-negative.us/soil/feedsoil.htm) to improve soil quality for living plants and enhance plant use of CO2 use as advocated by Hamaker. Rock dust collection could be an air pollution mitigation for cement kilns. • Improve organic content of local soils with mulch, compost, earthworms, EM/IMO, and other methods without using synthetic agricultural chemicals • Double digging for top soil development (FFI: http://www.organicgardening.com/learn-and-grow/double-digging-how) • Conserve local water resources and strive to reduce agricultural water consumption to assure adequate water supplies for farming under increasing heat / drought conditions • Experiment with crops that are more heat / drought resistant or tolerant	

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Desired Outcome	S.A.P. Action
reduce the number of impoverished small rural farm families	• Use S.A.P. to empower impoverished rural farm families to feed themselves • Groups of small rural farmers using S.A.P. may be able to generate small surpluses to boos the food supply available in village markets • F2C2M micro-credit may empower impoverished rural farmers to use S.A.P. to get a fresh start
improve the quality of life for the rural poor (and thereby in rural communities)	• Food security for small rural farm families is a good first step to improving their quality of life. • Added income from surplus farm produce helps alleviate debt burdens and improve family income.
make education a life-long process of the local culture (The F2C2M program might involve giving access to schools willing implement some of the items mentioned in this section.)	• The RTC-TH Community-based Education model empowers people to become their own best teaches a. It does not replace or compete with existing school systems. It supplements them outside the classroom. It can be adapted to local conditions. (FFI: http://www.neighborhoodlink.com/RTC-TH_Tech/pages) • Integrate S.A.P. as applied school lessons to expose students to multi-disciplinary learning models. This presents real-world examples of using math, science, language, and technology. A hands-on lab is a school garden to grow food for the school cafeteria. This gets the next generation of farmers to see S.A.P. as "normal" and routine practice. It also provides insights to jobs and job readiness skills. • Make S.A.P. community service projects an integral part of the school curriculum. Students work on a community project related to S.A.P. as a demonstration of the effectiveness of the methods. It also builds a sense of community and civic responsibility. • Integrate S.A.P. with secondary and post secondary education with an eye toward developing small rural enterprises. For example, a school organizes a community service project team to make SRI weeding tools. The team might consist of students studying business, mechanics, metal working, agriculture, and education. Relevant government officials and business members can be guest speakers. They could make students aware of relevant government policies and programs. Bankers could talk about local financial resources and programs. The students work together. Each "specialist" contributes their "expertise" but is exposed to the needs / issues of the other specialists. This fosters "seeing the big picture", learning about "trade-offs" and compromises, and working in a multi-disciplinary environment. This is realistic job readiness training. • Integrate schools to communities with an eye toward diffusing S.A.P. education and technology to the community. This can be done by taking the project mentioned above to involve local villagers (non-students). The school and a village (or group of villages) might engage in a matching agreement to support the project. The integrated student team pairs up with village members of similar interests / expertise. The goal is to implement the project in the village with students as the teachers. The students "teach back" to the villagers to verify and validate their education. The teachers monitor / nurture (mentor) the students but do not actually do the teaching. There should be periodic follow-ups to assess the project. This approach gives students real world experience and potential job contacts. Some students might return to their home villages after graduating and start a business. The villagers gain education / training not often available to them. The school does community outreach giving them an opportunity to recruit students / teachers, and to be relevant to the local community.

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Desired Outcome	S.A.P. Action
make education a life-long process of the local culture (The F2C2M program might involve giving access to schools willing implement some of the items mentioned in this section.)	• The RTC-TH Community-based Education model empowers people to become their own best teaches a. It does not replace or compete with existing school systems. It supplements them outside the classroom. It can be adapted to local conditions. (FFI: http://www.neighborhoodlink.com/RTC-TH_Tech/pages) • Integrate S.A.P. as applied school lessons giving students real world examples of using math, science, language, technology in a school garden to grow food for the school cafeteria. This gets the next generation of farmers to see S.A.P. as "normal" and routine practice. • Provide basic financial skills training (e.g. family budgeting) to small rural family farmers. This could also be done as applied elementary school lessons. This empowers people to better manage their family finances. • Make community service projects an integral part of the school curriculum. Students work on a community project related to S.A.P. as a demonstration of the effectiveness of the methods. For example, students help create and maintain a garden for elderly/infirm/needy community members who have limited means. The produce helps support these community members and imparts a sense of community, compassion, and social responsibility to the students. • Integrate S.A.P. with secondary and post secondary education with an eye toward developing small rural enterprises. For example, a school organizes a community service project team to make SRI weeding tools. The team might consist of students studying business, mechanics, metal crafting, agriculture, and education. Relevant government officials and business members can be guest speakers. They could make students aware of relevant government policies and programs. Bankers could talk about local financial resources and programs. The students work together. Each "specialist" contributes their "expertise" but is exposed to the needs / issues of the other specialists. This fosters "seeing the big picture", learning about "trade-offs" and compromises, and working in a multi-disciplinary environment. This is realistic job readiness training. • Integrate schools to communities with an eye toward diffusing education and technology to the community. This can be done by taking the project mentioned above to involve local villagers (non-students). The school and a village (or group of villages) might engage in a matching agreement to support the project. The integrated student team pairs up with village members of similar interests / expertise. The goal is to implement the project in the village with students as the teachers. The students "teach back" to the villagers to verify and validate their education. The teachers monitor / nurture (mentor) the students but do not actually do the teaching. There should be periodic follow-ups to assess the project. This approach gives students real world experience and potential job contacts. Some students might return to their home villages after graduating and start a business. The villagers gain education / training not often available to them. The school does community outreach giving them an opportunity to recruit students / teachers, and to be relevant to the local community.

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