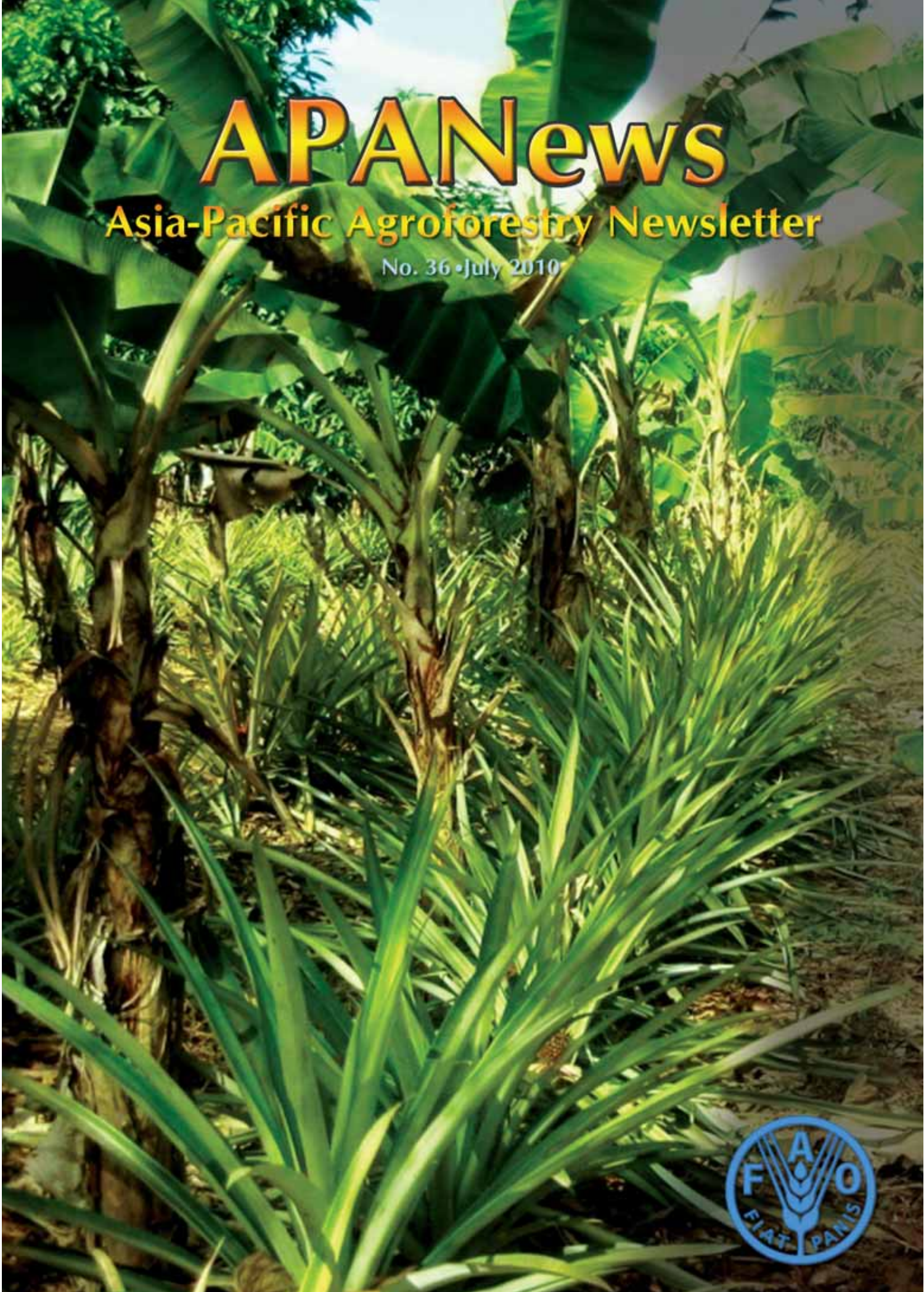

APANews

Asia-Pacific Agroforestry Newsletter

No. 36 •July 2010

Dear Readers

Welcome to the 36th issue of APANews! In this issue, we feature articles on how to better improve agroforestry farms to increase productivity and maintain sustainability.

Those who are new to agroforestry may read about its potential to address challenges to agriculture in semi-arid regions. The article presents the different agroforestry systems to choose from to increase productivity and discusses the vital role of support systems (i.e., supportive policies, research and development, extension support, financing, etc.) to ensure success.

One article from India discusses the findings of a research on the effects of light intensity on the productivity of an integrated agroforestry system. Read more on how best to modify light and moisture to improve overall crop growth and yield of *Swietenia mahagoni* L. and *Capsicum annum* L.

Another article discusses the process of producing quality planting stock of *Terminalia chebula* for integration in agroforestry farms. Find out how to identify the mother tree and key propagation techniques that could be used to generate high quality seedlings. The article also presents the medicinal and other benefits of this popular medicinal tree in India.

This issue also features two interesting articles from the Philippines. One article describes the different indigenous farming practices in northern Philippines and attempts to classify them according to the categories of agroforestry systems recognized today. Find out the prominent farming systems being practiced in Abra, Philippines; the awareness of farmers about agroforestry; and recommendations on how to make the systems more productive.

The other article presents how a grassland area in southern Philippines has been transformed into a successful agroforestry enterprise. Read more about the story behind the Lao Integrated Farm and how it was able to integrate livestock raising, Sloping Agricultural Land Technology, use of biogas, and the production of various products while providing jobs and livelihood to more than 50 families in the area.

We also feature an article on the adoption of a quad-partite model of contract farming for industrial agroforestry. Find out how this model addresses the problems of raw materials among wood-based industries in India; and collaboration between farmers, processors, and consumers. The article also presents an overview on the state of wood-based industries and contract farming practices in India.

New developments in agroforestry education are presented through the accomplishments of the Southeast Asian Network for Agroforestry Education (SEANAFE). The Network completed its Phase II operations, with support from the Swedish International Development Cooperation Agency (Sida), and has successfully transitioned into an international NGO. Read more about their education, research, and training initiatives to date.

We continue to feature useful websites and information resources to assist your various undertakings in agroforestry research, agroforestry promotion and development, and agroforestry education.

Thank you to all the contributors and we hope to receive more articles from you in upcoming issues of APANews! •

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COVER. A study finds that indigenous communities in Abra, northern Philippines have been practicing the integration of perennial and annual crops in an organized manner to produce diversified products, sustain production, and maintain farm integrity (*See story on page 10*).

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Exploring the effects of light intensity on mahogany (*Swietenia mahagoni* L.) and chilli integrated farming system (*Capsicum annum* L.) in India

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Agroforestry systems improve yields of both tree and understorey crop components. Appropriate selection and combination of trees and crops provide increased yields and therefore raise incomes, improve soil fertility, promote land sustainability, and maximize the use of light (Singh and Osman 1987; Gill *et al*. 2003). At present, however, very few attempts have been made to evaluate the effects of light intensity on the productivity of the different components of agroforestry under varying site conditions in the terai zone of West Bengal, India.

To help improve farming techniques, the Uttar Banga Krishi Viswavidyalaya (UBKV) studied the effects of light intensity or photosynthetically active radiation (PAR) diffused through the tree canopies of mahogany *(Swietenia mahagoni* L.) on eight different chilli (*Capsicum annum* L.) genotypes. The study was carried out at the experimental farm of UBKV, Pundibari, India. The subtropical study site has a mean annual rainfall of 3 000 mm with a rainy season that runs from April to October and a highly pronounced winter season. The soil is sandy loam with low water-holding capacity.

Mahogany saplings were planted during the rainy season of 2003. Spacing was set at 5 m x 3.5 m, with an average height of 8.95 m, diameter at breast height of 9.22 cm, crown area per tree of 1.9 m^2, with a tree density of 572/ ha. Eight different chilli genotypes viz. CA-5, CA-9, CA-11, CA-12, CA-13, CA-14, CA-17 and Bhagyalaxmi were planted during the winter seasons of 2005 to 2007 with a plot size of 3.0 m x 2.25 m using 45 cm x 30 cm spacing. The crops were managed by a recommended package of practices i.e., farmyard manure at 20t/ha and N: P_2O_5; K_2O at 100:50:50 kg/ha.

The experiment was laid down in a replicated randomized block design. Light intensity was recorded daily, from 12 noon to 1 pm, using a digital lux meter and presented every week (Table 1). Plant height, girth, spread, primary branches per plant, secondary branches per plant, fruit length, and diameter and yield of chilli were recorded (Table 2).

Table 1 shows that the average light intensity varied from 214.67 x 100 to 770.13 x 100 lux under the agroforestry system during the period of 21 weeks. Light intensity, as a fraction of total light intensity, available to chilli varied from 41.87 percent to 81.70 percent with an average of 63.68 percent. The remaining 36.32 percent light intensity was absorbed or reflected by the trees. The tree canopy reflected some of the light, which can be measured by estimating the albedo – the ratio of reflected and received radiation. The agroforestry system showed the albedo ranging from 0.22 to 1.39, on an average of 0.63. The increasing or decreasing pattern of light intensity was observed in the agroforestry system because of the attributes of tree species and angularity of solar radiation, especially during the day. This pattern conforms to the findings of Ovington and Madgwick (1955).

Light, moisture and nutrients are critical factors that influence the overall crop growth and yield of agroforestry systems. It was clearly observed that the interaction between crop growth and genotypes showed a significant relationship. Table 2 indicates that crop growth and yield were significantly different among genotypes.

Maximum plant height was recorded in CA-14, followed by CA-12, while minimum height was observed in CA-11. Highest stem girth was recorded in CA-5, while the lowest value was in CA-13. Similarly, the significantly maximum and minimum plant spread was recorded in CA-14 and CA-13, respectively. Primary and secondary branches were significantly affected by growing conditions and genotypes. The highest number of primary branches was recorded in CA-12 and CA-17, while the lowest number was observed in CA-13. Maximum and minimum number of secondary branches was observed in CA-5 and CA-14, respectively. This might be due to the plants' adaptation to expose a larger photosynthetic surface under limited illumination and capture limited PAR. These results are well supported by the findings of Baig and Gill (2005) and Attridge (1990).

Further, Table 2 indicates the longest and highest fruit diameter in Bhagyalakshmi and CA-5. Minimum fruit length and diameter was observed in CA-11 and CA-

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Exploring the effects...

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12, respectively. Likewise, among the different chili genotypes, highest yield was recorded in CA-11 followed by CA-5 and minimum yield was observed in Bhagyalakshmi. Variation in crop growth and yield among the chili genotypes might be due to the variation in light intensity, photosynthetic activity, the reserve dry matter in shoots and efficient partitioning of dry matter to yield. Similar findings were also reported by Ram Newas *et al*. (2007), which indicate a direct relation in productivity with the agroforestry system. From these findings, it might be concluded that genotypes CA-11 and CA-5 may be selected for a mahogany-based agroforestry system in the terai zone of West Bengal, India. •

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References: 1) Attridge, T. H.1990. Light and plant responses. Edward Arnold, A division of Hodder and Soughtton Ltd., pp. 82-101; 2) Baig, M. J. and A. S. Gill. 2005. Photosynthetically active radiation affects tree-crop growth and productivity in semi arid, rainfed agroforestry. APA News 27:6-7; 3) Gill, A.S., M. J. Baig, A. K. Bisaria and R. Debroy. 2003. Effect of transmission of photosynthetic active radiation (PAR) in tree-wheat agroforestry system. Indian J. Forestry 26(3): 286-290; 4) Ovington, J.D. and H. A. I. Madgwick. 1955. A comparison of light in different wood lands. Forester 28:141-146; 5) Ram Newas, A. S. Dar, M. K. Bhargava, R. S. Yadav and Ajit.2007.Effect of management practices on growth of white siris (Albizia procera) grain yield of intercrops, weed population and soil fertility changes in agrisilviculture system in semi-arid India. Indian J. Agricultural science 77:403-407. 6) Singh, R.P. and M. Osman.1987. Agroforestry system for small holdings. International Workshop on Agroforestry for rural needs. Vigyan Bhawan, New Delhi, February, 22-26.

Table 1. Variation of light intensity under mahogany-based agroforestry system.

No. of weeks	Av. Light intensity under agroforestry (x 100 lux)	Av. Light intensity in nearby open area (x 100 lux)	Percent light available to the crop	Percent light absorbed or reflected by trees	Albedo
1	465.92	682.5	68.27	31.73	0.46
2	298.75	398.9	74.89	25.11	0.33
3	414.61	658.23	62.99	37.01	0.59
4	314.29	606.46	51.82	48.18	0.93
5	294.79	590.65	49.91	50.09	1
6	273.78	588.17	46.55	43.45	0.93
7	256.11	514.1	49.81	50.19	1.01
8	300.8	563.55	53.37	46.63	0.87
9	285.35	681.5	41.87	58.13	1.39
10	214.67	482.02	44.53	55.47	1.24
11	312.57	463.34	67.46	32.54	0.48
12	688.89	845.39	81.49	18.51	0.23
13	460.92	692.25	66.58	33.42	0.5
14	510.06	874.37	58.33	41.67	0.71
15	640.68	902.12	71.02	28.98	0.41
16	714.82	935.52	76.41	23.59	0.31
17	770.43	942.93	81.7	18.3	0.22
18	710.57	933.87	76.09	23.91	0.31
19	694.43	886.72	78.31	21.69	0.28
20	644.43	836.72	77.02	22.98	0.3
21	410.4	696.1	58.96	41.04	0.7
Mean	460.82	703.59	63.68	36.32	0.63

Table 2. Growth and yield parameters of chilli genotypes under agroforestry system.

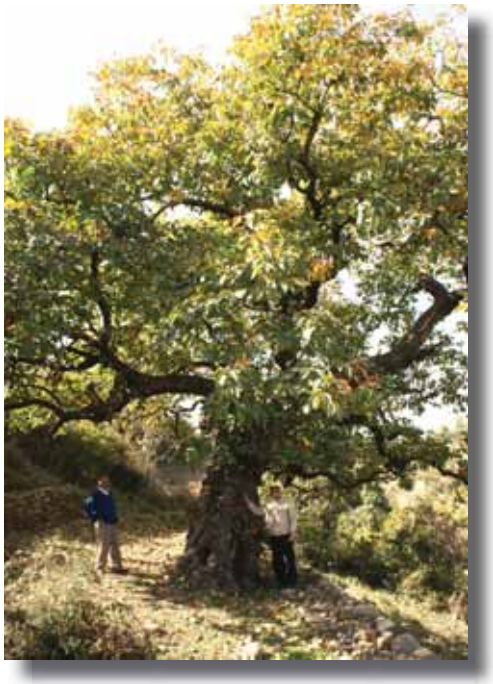
Genotypes	Plant height (cm)	Stem girth (cm)	Primary branches per plant	Secondary branches per plant	Plant spread (cm)	Fruit length (cm)	Fruit diameter (cm)	Yield (tons/ ha)
CA-5(V1)	96.13	1.56	5.27	18.44	52.83	5.78	1.13	8.03
CA-9(V2)	100.53	1.54	5.07	18.27	56.1	5.56	1.07	7.61
CA-11(V3)	90.9	1.4	5.2	16.9	51.42	5.03	1.06	9.15
CA-12(V4)	107.17	1.55	5.9	15.37	55.45	5.25	0.78	6.77
CA-13(V5)	97.63	1.38	4.8	14.33	48.1	6.11	1.07	5.74
CA-14(V6)	109.63	1.41	5.47	13.07	56.73	5.69	0.98	5.87
CA-17(V7)	96.83	1.45	5.9	15.2	52.33	6.34	1.04	5.74
Bhagyalaxmi(V8)	99.77	1.43	5.37	17.07	50.83	6.65	0.83	4.88
CD (5%)	7.58	0.22	0.84	2.74	3.33	0.62	0.13	1.05

Producing quality planting stock of *Terminalia chebula* for integration in agroforestry farms

Mohammed Saleem, Kamal Kishor Sood and Pardeep Singh

Agroforestry diversifies production, sustains livelihoods and minimizes the collection of tree products from forests. Aside from the tree, agricultural crop, and livestock components of agroforestry farms, some farmers are also integrating multipurpose medicinal plants. However, they are constrained by a lack of superior and quality germplasm, the long gestation period, and poor knowledge of propagation techniques.

Terminalia chebula is a popular multipurpose medicinal tree in India. The species belongs to the family *Combretaceae* and is commonly known as *harad*. The species grows well in tropical and subtropical regions of the Himalayan tracts up to an elevation of 1 500 m (Singh 1992).



This Terminalia chebula tree in the province of Jammu and Kashmir, India has earned the reputation of being raj harad or king of harad.

Medicinal and other benefits

The medicinal benefits of *harad* come from its fruits. They are used locally as a major constituent of *triphala,* a local medicinal digestive stew, and commercially as Ayurvedic medicines to treat heart burns, flatulence, dyspepsia, liver and spleen disorders, asthma and constipation. The fruits are rich in tannin which is used for tanning leather. The fruits also contain chebulagic, chebilinic acid and corilagin.

India is the main producer and exporter of *harad* fruits to Europe and the U.S. (World Agroforestry Centre no date). The fruits are collected by the local people, dried and roasted in sand until the color turns golden brown. They are then sold to middlemen.

Fruits from the 'raj harad' (top) are larger than the fruits of other mother trees (bottom).

Aside from the fruits, the leaves of *harad* are used as green fodder and feed for livestock during winter.

Identifying the mother tree

Fruits are the most in demand product of *harad.* Large-sized fruits fetch a higher price in the market. Hence, fruit size is an important consideration when identifying mother trees. One of the mother trees from the locality of Mathwar in the province of Jammu and Kashmir was found to have the maximum mean weight, length and width of fruits. The tree earned the reputation of being *raj harad* or king of *harad.* This mother tree was thus chosen for further propagation.

Propagation techniques

Cleft grafting and patch budding of scions from the *raj harad* in the month of April sprouted better than in any other month. Some of these grafts bore fruits as early as the nursery stage (1 year). Once transplanted, the grafts already bore fruits. Three years after, the fruits could be easily harvested from the low-lying branches. The size of the fruits was found to be the same as that of the mother tree.

Impact and recommendations

The results of the study sparked the interest of many farmers who were looking for superior seedlings of *Terminalia chebula* for integration in their agroforestry farms.

Although the leaves of the *raj harad* seedlings show thripps, these could be controlled by spraying confidor (0.4 ml/lt) or endosulfan (2 ml/lt). Further, the plantation of *raj* harad seedlings was found to be frequently visited by various species of honey bees which could make the area a potential bee apiary.

It is thus recommended that farmers should be made aware that quality planting stock of *Terminalia chebula* is now available. They also need to be educated on the

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Producing quality...

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propagation techniques that could be employed.

The integration of *Terminalia chebula* in agroforestry farms could provide farmers with multiple products which could eventually improve their livelihood and quality of life. •

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References: (i) Singh, R. V. Fodder trees of India. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi. 663pp.; (ii) World Agroforestry Centre. n.d. Agroforestry Tree Database. World Agroforestry Centre, Nairobi

Seedlings for 'raj harad' start bearing fruits after the first year.

One-year-old grafted seedlings from 'raj harad.'

Grafted seedlings of 'raj harad' bear flowers after the first year.

Grafted seedlings of 'raj harad' bear fruits after three years.

Agroforestry to help address challenges to agriculture in the semi-arid region of India

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Agriculture in the semi-arid sub-tropics of India continues to suffer because of low and erratic rainfall. The mean annual rainfall in this region falls below 900 mm, and the evaporation rate is 1 800 mm. The soil is shallow and undulating, and has low fertility and poor water-holding capacity. Farmers in this region face other challenges that pose risks to agriculture.

Challenges to agriculture

Most areas are still under rainfed or dryland agriculture. Without sufficient rainfall, it is difficult to obtain proper harvests.

The prices of inputs continue to increase, especially diesel, fertilizers and seeds. These expensive inputs do not assure high yields in farms.

Although farmers are using technologies and inputs, they are not assured of getting good prices for their produce.

Even with full government support, the increasing population is forcing farmers to give up their good agricultural lands to urbanization.

The potential of agroforestry

Agroforestry integrates different land use systems and adopts an interdisciplinary approach to farming. It considers the influence of social, ecological and economic factors. Agroforestry has the potential to increase yield, diversify farm produce, minimize risks, conserve resources, and improve livelihoods.

Agroforestry plays productive and service roles. It promotes productivity by providing farmers with the 5Fs – food, fodder, fuel, fruits and fertilizer. It also services farmers by conserving soil and moisture, improving soil fertility, reducing wind erosion, and providing shelterbelt/windbreaks.

Agroforestry systems in the semi-arid region

Considering the challenges and conditions in the semi-arid region, farmers can choose to venture into different agroforestry systems – agrisilvicultural (tree + crop), agri-horticultural (fruit tree + crop), agrisilvipasture (tree + grasses), boundary plantation (tree on boundaries + crop), alley cropping (tree in strips + crop) and horti-pastoral (fruit tree + grasses) systems. However, farmers need to manage the tree component of the agroforestry systems well to ensure success.

The tree component occupies 20 percent of the area. Planting of trees must be timely and should use appropriate spacing. It is better to use multipurpose (e.g., Acacia, Dalbergia, A.indica, Albizia, etc.) and nitrogen-fixing trees. Aside from providing multiple uses to farmers (food, fodder, fuel, building materials, etc.), such trees can improve soil fertility and characteristics.

Ensuring the success of agroforestry

Management of the different components of agroforestry farms must be supported by supportive government policies, appropriate research and development, extensive extension support, practical financing, proper education of farmers, quality planting stock and other inputs, and ideal marketing and post-harvest facilities. •

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Transforming an underutilized area into a booming agroforestry enterprise

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Once a highly cogonal area located at the footslopes of Mt. Apo in Davao, southern Philippines, the Lao Integrated Farm has evolved into a booming micro-enterprise.

The farm was initially established by integrating the raising of goats under coconut trees. It utilized goat manure as organic fertilizer. The area was further developed using Sloping Agroforestry Land Technology to support the increasing number of goats being raised.

Use of organic inputs

Eventually, the farm ventured into the production of high-value commercial fruits. It uses 100 percent indigenous biological and organic pesticides and fertilizers (i.e., vermicompost) from agro-wastes generated from the farm.

Goats are both being raised and bred for milk production. Biogas is utilized to pasteurize and process fresh and chocolate milk, coco sap drink, and coco honey and coco sugar. The latter two products have been approved by the Bureau of Food and Drug for commercial distribution (Figure 1).

Maintenance

The farm maintains 30 regular employees and 52 coco toddy collectors. Local people are being tapped for processing activities in the coco sap processing plant which has been accredited by the Department of Science and Technology (DOST). The increasing demand for coco honey and coco sugar in the local and export markets are providing employment to local folks around the farm and from nearby barangays. As farm income increases from the sale of processed products so does the income of local employees.

Recognition and linkages

All the efforts put into the Lao Integrated Farm earned various regional and national awards – the 2008 Gawad Saka Award for Coconut Farm Category,

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Fig. 1. Products of and awards received by the Lao Integrated Farm in Davao, southern Philippines.

Transforming...

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2009 Presidential Award for Micro Entrepreneurs, the 2009 Productivity Olympics for Best Productivity Improvement Program and the 2009 Go Negosyo-Business Excellence Award.

Strong linkages with various agencies were also recognized as a key factor to attaining success. Some of these agencies included the Department of Environment and Natural Resources-Region XI (Special Concern Office), Department of Labor and Employment-Region XI, DOST - XI, Department of Social Welfare and Development-Region XI, Department of Trade and Industry-Davao del Sur, the Mindanao Baptist Rural Life Center, Philippine Coconut Authority-Davao del Sur, Provincial Local Government Unit-Office of the Provincial Agriculturist-DavSur Farmers Information and Technology Services Center, and the Southern Philippines Agri-Business and Marine and Aquatic School of Technology (SPAMAST) as the partner member agency of the Techno Gabay Program of the DOST-Philippine Council for Agriculture Resources Research and Development-Southern Mindanao Agriculture Resources Research Development Consortium.

Formerly operating under sole proprietorship, the Lao integrated farm now operates as a corporation. •

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Fig. 2. Office and display area for products of the Lao Integrated Farm.

References: (i) Lao, B. R. 2009. The Lao Integrated Farm. Personal Communication. August 2009; (ii) Lao, B.R. 2010. The Lao Integrated Farm Inc. Personal Communication. January 2010; (iii) S&T-Based Farm on Enhanced Coco Sap Products in Bansalan, Davao del Sur. 2009. Pp. 15; (iv) Supino, S. R. 2008. Turning Barren Place to an Agriculture Paradise. Sunstar Davao. December 2008. http://167.225.139.201/davao/turning-barren-place-agriculture-paradise.

Adapting the quad-partite model of contract farming for industrial agroforestry

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The rate of deforestation in India is worsening at 1.5 million ha per year. Forested areas have been reduced by 23.57 percent of the total land area. In the state of Tamil Nadu, forested areas were estimated at 17.41 percent (Forest Survey of India, 2005), way below the required 33 percent forest cover. Dwindling forest cover has resulted in low productivity (less than 1m^3/ha/yr), thereby contributing to a shortage in supply of both domestic and industrial wood (Parthiban and Govinda Rao 2007).

Shortage of raw materials is the biggest challenge faced by wood-based industries in India. To help address this problem, the government implemented a conservative forest policy which encourages farmers to cultivate underutilized and marginal agricultural lands. The policy aims to expand cultivated areas and agroforestry farms through multistakeholder participation. However, difficulties arose in the implementation of the policy – local people were not involved, there was lack of quality planting stock and a lack of assured markets.

In the current marketing system, the middlemen and local contractors decide the time of harvests and dictate a fixed price for the produce. Further, the lack of an efficient production-to-consumption system, including incentives to raise prices and an assured market to sell the produce, continue to make the lives of tree farmers difficult.

One way to address these challenges is by contract farming. Contract farming is an agreement between farmers, processors and consumers (Eaton 1998; Gahukar 2007). The agreement involves the supply of farm-grown pulp wood to the wood-based industries by the farmers, and industries should provide a minimum support price of Rs. 2000 per ton for Casuarina and Rs. 1800 per ton for Eucalyptus. This agreement also facilitates felling and transportation of raw materials by the industries at their own cost, which results in strong linkages between industries and farmers. Once an agreement is made between the farmers and industries, the farmer can avail of credit facilities from financial institutions. Contract farming is now being viewed as a means to deal with the shortage of raw materials

being experienced by wood-based industries in India.

Through the quad-partite model of contract farming, where public-private partnership is introduced, tree farmers in Tamil Nadu can link directly with industries and at the same time augment the existing wood supply. The model of contract farming used short rotation pulp wood clones. It involved various stakeholders and was proven successful in terms of adoption and income-generation.

Pulp wood industries

Two pulp wood-based industries in the state – Tamil Nadu News Prints and Papers Limited (TNPL) and Karur and Seshasayee Paper Board (SPB), Erode – are promoting contract farming. Both consortiums predominantly use hardwood obtained from government plantations and partly from open sources. They use high-yielding, short-rotation clones developed by research institutes.

Existing supply chain

Wood supply comes from two sources. Major raw materials come from the Tamil Nadu Forest Plantation Corporation (TAFCORN), which accounts for nearly 1.5 lakh tons of wood pulp supply (Tamil Nadu Newsprint and Papers Limited, 2008). The remaining supply comes from farm lands through traders.

In the existing supply chain, the farmers sell the whole plantation without considering the actual volume of the growing stock, thereby resulting in minimal returns. The local contractors then buy the trees from the plantations, cut the trees and classify them into poles, pulp wood and firewood. Only wood sized 1-2 in was supplied to industries, while other sizes were sold as poles by traders. This marketing scheme resulted in uncertain and erratic pulp recovery and quality (Seshasayee Paper Boards, 2008).

Quad-partite model of contract farming

To augment the existing supply chain system, the Forest College and Research Institute, Tamil Nadu Agricultural University, developed a quad-partite model of contract farming involving research institutes, farmers, industries and financial institutions (Figure 1). The model was successfully introduced in the state of Tamil Nadu and adapted for pulp wood-based agroforestry.

In the model, the Forest College and Research Institute (TNAU) developed short-rotation clones and provided pre- and post-plantation technical assistance to farmers and staff to advance site-specific precision silvicultural technology.

The industries mass reproduce the potential genetic materials identified by the research institutes in a decentralized manner and supply them at subsidized costs. The industries also facilitate felling and transport at their own expense. This process strengthened the link between industries and farmers. The financial institutions, meanwhile, provided credit to the farmers. The industries helped repay the loan after sourcing the raw materials from the farmers.

Industrial wood plantations covered under contract farming

To monitor and make the process more efficient, contract farming activities were confined in a compact area – 200 km from the mill. At the time of the study, the two industries concentrated their contract farming efforts in 16 districts, covering nearly 16 187 ha and involving nearly 8 000 beneficiaries.

Farmers in the districts of Trichy, Pudukkotai, Sivagangai and Karur preferred using *Eucalyptus* clones viz., *Eucalyptus tereticornis* and *Eucalyptus camaldulensis* for their rainfed pulp wood plantations. The farmers in Cuddalore, Tanjore, Villupuram, Vellore, Nagapattinam and Thiruvarur districts, meanwhile, preferred *Casuarina* clones viz., *Casuarina equisetifolia* and *Casuarina junghuhniana* for its higher returns and short-rotation harvest.

Benefits of contract farming

Farmers who ventured into *Casuarina*-based plantations harvested in 36 months with an average yield of 100 -187 tons per ha, and generating an income of US$4 298-8 151 per ha. The farmers practiced intercropping during the first year, which earned them US$536 per ha.

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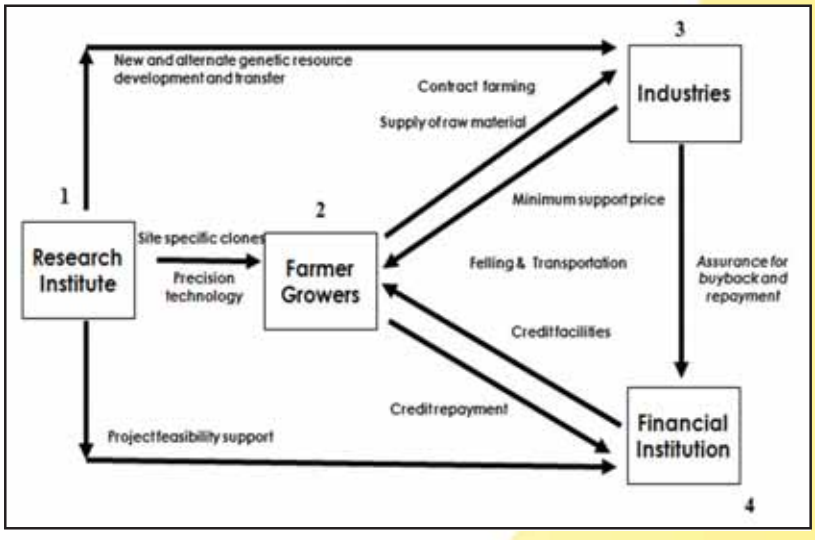

Fig. 1. Quad-partite model of contract farming.

Adapting the quad-partite...

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With these benefits, more and more farmers became interested in the quad-partite model of contract farming as an approach to industrial agroforestry. At the same time, they were attracted by the use of short-rotation clones and the assured market and fixed price offered by the wood-based industries.

Casuarina tree plantation in Namakkal, Tamil Nadu, India established through quad-partite model of contract farming.

Conclusion

Tree farming in Tamil Nadu, India, is gaining momentum because of the quad-partite model of contract farming. The model introduced the concept of public-private partnership. It offers long-term and complementary benefits to both the farmers and wood-based industries.

The model contributed significantly to the successful establishment of *Eucalyptus*- and *Casuarina*-based pulp wood plantations, thereby promoting farm forestry in the state. The successful implementation of the model attracted more farmers to venture into industrial tree plantations and sustainable energy farming. •

Acknowledgement: Indian Council Agricultural Research and World Bank for funding the project "A Value chain on Industrial Agroforestry in Tamil Nadu."
K. T. Parthiban, S. Vennila and M. Govinda Rao can be contacted at the Forest College and Research Institute, Tamil Nadu Agricultural University, Mettupalayam – 641 301, India. R. Seenivasan can be contacted at 3- Tamil Nadu Newsprints and Papers Limited Kagithapuram, Karur District, India.
References: (i) Eaton, C.S. (1998). Adaptation performance and production constraints of contract farming in China. (unpubl.) Ph.D. thesis), Department of Geography, University of Western Australia, Perth; (ii) FSI, (2005). State of Forest Report- 2003, Forest Survey of India, Dehradun. 134 p.; (iii) Gahukar, R.T. (2007). Contract farming for organic crop production in India. Current Science 93 (12): 1661-1663; (iv) Parthiban, K.T. and M. Govinda Rao. (2007). Eucalyptus-based pulp wood programme in Tamil Nadu. Paper Presented at the Pulp wood Workshop organized by TNPL at Trichy, 18th May, 2007; (v) Seshasayee Paper Boards (2008). Plantation Status Report, SPB, Erode; and (vi) Tamil Nadu Newsprint and Papers Limited (2008). Plantation Report. TNPL, Karur.

Classifying indigenous farming practices into agroforestry in Abra, Philippines

A. Jose Lucas B. Millare (ajolud@yahoo.com)

The Cordillera Administrative Region in Abra, northern Philippines, has diverse indigenous cultural communities which are mostly located in the uplands. Farming is the main livelihood of the communities. However, very little documentation is available about the farming systems they practice.

A study was conducted to: (i) determine the awareness of farmers about agroforestry; (ii) describe the existing farming practices in the area; (iii) evaluate if the farming practices could be classified as agroforestry systems; and (iv) recommend ways to enhance productivity of the farming practices. Data gathered from literature reviews, key informant interviews, and field visits were analyzed using descriptive statistics.

Awareness of farmers about agroforestry

The majority (90%) of the farmers were aware of agroforestry. They believed that their farming practices may be considered as agroforestry systems.

Existing farming practices classified into agroforestry systems

Existing farming practices consisted of trees, shrubs, palms, bamboos, food crops and livestock that were utilized and managed in some form of arrangement or sequence. Upon evaluation, the majority of the upland farmers in Abra were practicing the multistorey system, the hedgerow/alley cropping system, live fence and boundary planting, and windbreaks.

Multistorey systems. The multistorey system was the most prominent in the province. This system may be further classified as indigenous and introduced. Indigenous multistorey systems have been in existence for generations. Introduced multistorey systems, on the other hand, were developed through research/experiments that could be adopted by other communities.

Farmers do not follow an orderly pattern in the arrangement of crops (spatial relations) in indigenous multistorey systems. Crops are scattered and irregularly spaced (Figure 1). This type of system was also observed in areas where natural stands were converted into multistorey agroforestry projects (Figure 2). Meanwhile, introduced multistorey systems were observed in unutilized areas that were converted into agroforestry projects.

In these areas, there is a definite arrangement or pattern of crops (Figure 3).

Windbreaks. In areas where seasonal strong winds prevail, farmers plant rows of trees or bamboos to protect their crops from strong winds (Figures 4 and 5).

Boundary planting. Planting of trees around the farms or home lots is a common practice in the province. Boundary planting is used to demarcate areas, maintain privacy and protect agricultural crops (Figure 6).

Hedgerow/Alley cropping. Farmers establish a strip of grass vegetation along the contour in sloping areas. Spaces between the strips of grasses (alleys) are planted with corn, sweet potato and other cash crops. This farming system can be easily transformed into agroforestry by introducing trees or perennial crops (PCARRD 2006). This system may be considered a prelude to a hedgerow intercropping system (Figure 7).

Classification of existing farming systems into agroforestry

Structure. By structure, the existing farming practices in Abra could be classified as agroforestry systems. The features conform to the classification of agroforestry systems proposed by Getahun and Reshid (1998) and Nair (1985). According to their propositions, the farming practice may be classified as an agrisilvicultural system when trees are grown in association with crops; as a silvipasture system when trees are grown in association with livestock; and as an agrisilvipasture system when trees are grown in association with both crops and livestock. Figures 8, 9 and 10 illustrate the farming systems that conform to the classifications mentioned above.

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Fig. 1. An indigenous multistorey system with irregular arrangement of agroforestry crops in Maguyepyep, Sallapadan and Manabo, Abra, Philippines.

Fig. 2. A natural stand of commercial forest trees integrated with coffee trees arranged in an irregular pattern in Malibcong, Abra, Philippines.

Fig. 3. An introduced multistorey system in Layugan, Bucay, Abra, Philippines with a pre-determined arrangement of agroforestry crops.

Fig. 4. Rows of E. camaldulencis and Gmelina arborea trees are used as windbreaks by the OISCA farm in Ducam, Dolores, Abra, Philippines.

Fig. 5. Gmelina arborea trees are planted to protect tobacco from strong winds in Tukib, Villaviciosa, Abra, Philippines.

Fig. 6. Gmelina arborea trees demarcate the rice field and the farm area in Manabo, Abra, Philippines.

Classifying indigenous...

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Landscape. The study found two types of landscapes – segregated and integrated agroforestry. The segregated landscape involves intensive cultivation of trees and agricultural crops which are kept apart according to terrain limitations (Figure 11). The integrated landscape, meanwhile, demonstrates the interplanting of perennial and annual crops in an organized pattern to sustain production and maintain farm integrity (Figure 12).

Highlights of results

The province of Abra demonstrates four distinct farming systems–multistorey, hedgerow/alley cropping, live fence/boundary planting and windbreaks. Interviews revealed that farmers have no local names for these farming systems. No additional new farming systems were discovered.

Farmers often practiced the multistorey system. Although the indigenous multistorey system was common, some farmers have introduced modifications in the spatial arrangement of crops.

In some areas, meanwhile, farmers employed the live fence/boundary planting to demarcate farm boundaries and protect their properties. Rows of trees or bamboos were also planted around the farms to act as windbreaks and protect crops against strong seasonal winds. In sloping or rolling terrain, hedgerow/alley cropping and contour terracing were employed.

Although the farmers in Abra are practicing systems that are very similar to agroforestry, the level of production in most areas was still generally low. This may be due to the farmers' lack of knowledge in plantation/crop management. They lack know-how on the appropriate spacing and cropping combinations that could maximize yield. A high

Fig. 7. Napier grass is planted in strips across slopes in Wayangan, Tubo, Abra, Philippines. Corn, sweet potato and cassava are planted in the alleys.

Fig. 8. A farmer in Manabo, Abra, Philippines integrates trees and agricultural crops similar to the agrisilviculture system.

Fig. 9. A farmer in La Paz, Abra, Philippines grows trees and raises livestock similar to the silvipasture system.

Fig. 10. A portion of a farm in La Paz, Abra, Philippines demonstrates livestock being raised under trees, similar to the agrisilvipasture system.

Fig. 11. A segregated landscape shows distinct separation of areas planted with trees and agricultural crops as demonstrated by a farm in Bao-yan and Sallapadan, Abra, Philippines. Segregation is due to limitations in terrain.

Fig. 12. A farm in Layugan, Abra, Philippines demonstrates the integrated landscape wherein perennial and annual crops are integrated in an organized manner to sustain production and maintain farm integrity.

soil erosion rate was also evident because of the lack of soil and water conservation measures.

Recommendations

Considering the results, it is recommended that:

Farmers undergo more training on agroforestry, including farm development and management, to further enhance productivity in their farms;

Development agencies intensify the provision of technical assistance to farmers, enabling them to enhance their knowledge and skills in agroforestry;

Farmers are encouraged to engage more in agroforestry production to enhance their livelihood initiatives and improve their way of life; and

Government intensifies support by improving farm-to-market roads and providing access to markets. •

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SEANAFE completes collaboration with Sida, successfully transitions into an international NGO

Jess C. Fernandez (herniatic@yahoo.com)

The Southeast Asian Network for Agroforestry Education (SEANAFE) has completed its collaboration with the Swedish International Development Cooperation Agency (Sida) in December 2009 for its Phase II operations.
SEANAFE is now an international nongovernmental organization (INGO) registered in the Philippines.

In a meeting held on 23 March 2010 at the World Agroforestry Center – Southeast Asia Regional Office (ICRAF-SEARO) in Bogor, Indonesia, Jorgen Eriksson, Sida representative, expressed satisfaction over the accomplishments and financial reports of SEANAFE.

He congratulated SEANAFE for achieving its objectives and targets and optimizing Sida's support. Likewise, ICRAF-SEARO Regional Coordinator, Dr. Ujjwal Pradhan, acknowledged Sida for its financial support.

Accomplishments

The meeting highlighted the following major accomplishments of SEANAFE:

- Expansion of institutional and country memberships (i.e., from 77 to 94 member-institutions and the addition of Malaysia as the newest country member);
- Completion of 20 regional and 95 country network projects under Sida grants and in collaboration with other partners;
- Implementation of capacity building programs for 230 lecturers from at least 72 SEANAFE member-institutions, and development of teacher's guides on the network's three sub-project themes, i.e., markets for agroforestry tree products (MAFTP), agroforestry landscape analysis (AFLA), and enhancing forest policy education (EFPE);
- Improvement of agroforestry course program and curricula of 22 member-institutions as a result of the mainstreaming of MAFTP and AFLA project outputs, including the production of complete course syllabi on the two subject matters in English and Bahasa Indonesia;
- Completion of 11 MS research fellowships;

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SEANAFE completes...

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- Completion of SEANAFE's impact study and institutional assessment;
- Implementation of an International Agroforestry Education Conference;
- Pilot-testing of a Regional Training Course on Sustainable Upland Agroforestry Development in Southeast Asia;
- Strengthening of existing and establishment of new partnerships for the collaborative implementation of both regional and country network activities; and
- Official recognition of SEANAFE as an INGO registered in the Philippines.

Lessons and challenges

SEANAFE's Technical Adviser, Dr. Jess C. Fernandez, also shared some challenges and lessons learned in ensuring the relevance, active commitment, and participation of the member institutions, efficient and effective governance and management of operations, and sustained interest from Sida as donor. He emphasized that SEANAFE's modest achievements proved that networking is a potent mechanism in building the capacities of a critical mass of faculty members from leading universities and colleges. The projects and corresponding outputs also raised the profile of agroforestry education in the region. All these efforts, according to Dr. Fernandez, were the results of defined project objectives, focused subjects of interest and activities, and available funding.

Further areas of collaboration

The meeting provided the opportunity for Sida to present its current organizational status, future thrusts and opportunities for collaboration in Southeast Asia. Sida is currently developing its strategic framework. Sida and ICRAF agreed to explore future collaborative undertakings based on this framework. Further, Sida signified its willingness to refer SEANAFE's proposals on capacity building initiatives to other donors as a result of the successful collaboration with the network.

Sida and ICRAF recognized the importance of SEANAFE as a partner in capacity building and advocacy in agroforestry in the Southeast Asia. They also expressed their intention to continue extending technical and financial support to SEANAFE whenever and however possible.

Next actions

As an INGO based in the Philippines, SEANAFE will focus its efforts on three major activities—(i) stabilizing the operation of its Secretariat; (ii) promoting its accomplishments and services to generate interest from other donors, and also address the need for technical assistance of prospective partners and clients; and (iii) enhancing its visibility among appropriate national and regional government bodies to gain endorsements to implement agroforestry-related projects at the country level. These initiatives will overall contribute to generating additional funding for SEANAFE to sustain its operations.

For more information about SEANAFE's activities as an INGO, contact the Secretariat, Institute of Agroforestry, College of Forestry and Natural Resource Management, University of the Philippines Los Baños, E-mail seanafe@yahoo.com.•

The author is the SEANAFE Technical Adviser.

Sida Representative, Jorgen Eriksson (second from left), discusses accomplishments and plans of SEANAFE during a meeting held on 23 March 2010 at ICRAF Southeast Asia Regional Office, Bogor, Indonesia.

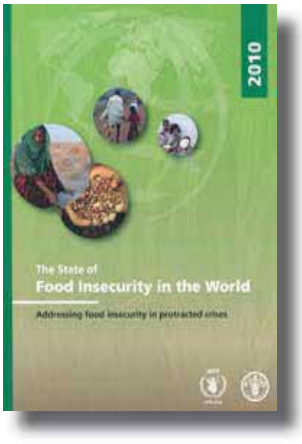
New publications for the bookshelf

Coping with a changing climate: considerations for adaption and mitigation in agriculture

Written by M. Glantz, R. Gommes and S. Ramasamy, this book presents some fundamental issues, challenges and concepts to improve the understanding of and preparations for coping with both the causes and the impacts of climate change on food security. The book elaborates on the critical considerations including basic ecological principles, assessment of impacts, vulnerabilities, invisible boundaries and suggestions for short-term and long-term policy options, as well as policy-driven strategic thinking for adaptation to and mitigation of climate change. Available: www.fao.org.

The State of Food and Agriculture 2009. Livestock in the balance

The livestock sector is transforming rapidly in response to shifts in the global economy and changing societal expectations. Society expects the livestock sector to provide safe and plentiful food and fiber for growing urban populations, livelihoods for more than a billion poor producers and traders as well as global public goods related to food security, environmental sustainability and animal-borne diseases. However, the rapid pace of change has led to unbalanced growth of the sector. This has manifested itself in a widening dichotomy within the sector in terms of the scale, intensity and efficiency of production and in unforeseen social, nutritional, animal health and environmental implications. These changes and the speed with which they are occurring have created systemic risks for livelihoods, human and animal health and the environment. To meet the challenges and constraints of the 21st century, the livestock sector requires appropriate institutions, research, development interventions and governance that reflect the diversity within the sector and the multiple demands placed upon it. Available: www.fao.org.



International technical workshop (An). Investing in sustainable crop intensification: The case for improving soil health

This publication is a report of a Workshop that brought together people from a wide range of institutions - farmers, researchers, extension agents, policy makers, donors - from 40 countries, who share a common concern about the non-sustainability of ways in which farm land is now being used and who are convinced that this must change. The Workshop focused on the growing evidence of success in the adoption and spread of Conservation Agriculture (CA) in developing countries. CA-based approaches to sustainable production intensification are highly relevant to the global response to rising food and energy prices, increasing soil and environmental degradation, pervasive rural poverty, climate change and increasing water scarcity. The accompanying CD-ROM contains all the workshop presentations. Available: www.fao.org.

Jatropha: A smallholder bioenergy crop. The potential for pro-poor development

Jatropa is an underutilized, oil-bearing crop. It produces a seed that can be processed into non-polluting biodiesel, and grows under drought condition. Written by R. Brittaine and N. Lutaladio, this publication presents a compilation of information on key practical issues affecting jatropha for pro-poor development, based on the knowledge available from research reports and ongoing unpublished research material. It provides a brief overview of biofuels, their growth drivers and their potential impacts on poor societies. Available: www.fao.org.

Challenges and opportunities for carbon sequestration in grassland systems. A technical report on grassland management and climate mitigation

Practices that sequester carbon in grasslands can enhance productivity, and policies designed to encourage these practices could lead to near-term dividends in greater forage production and enhanced producer incomes. This report reviews the current status of opportunities and challenges for grassland carbon sequestration and identifies components that could foster the inclusion of grasslands in future climate agreements to enhance longer term adaptation to climate variability. It includes a policy brief to assist policy-makers in their development plans. Available: www.fao.org.

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New publications...

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Irrigation manual: Planning, development, monitoring and evaluation of irrigated agriculture with farmer participation (CD-ROM)

This irrigation manual, divided into 14 modules, aims at strengthening various aspects of irrigation development. The emphasis is directed mainly towards the engineering, agronomic and economic aspects of smallholder irrigation, in view of the limited practical references available in this area. This manual also introduces the irrigation practitioner to the social, health and environmental aspects, providing a bridge between the various disciplines involved in irrigation development. Available: www.fao.org.

The Journal of Sustainable Agriculture

The journal is devoted to the rapidly emerging fields of agroecology and sustainable agriculture. The journal focuses on the changes that need to occur in the design and management of our food systems in order to balance natural resource use and environmental protection with the needs of production, economic viability, and social well-being. It examines our current food systems from production to consumption, and the urgent need to transition to long-term sustainability.

The journal promotes the study and application of sustainable agriculture for solutions to the complex problems of resource depletion, environmental degradation, a narrowing of agrobiodiversity, continued world hunger, climate change, and the loss of farm land. Rather than focus on separate disciplinary components of agriculture and food systems, this journal uses an interdisciplinary approach to food production as one process in a complex landscape of agricultural production, conservation, and human interaction.

The Journal features articles on topics such as: innovative practices, new technology, Integrated Pest Management (IPM) programs, organic and biodynamic farming, sustainable energy use, economic, social, and philosophical aspects of sustainable agriculture, linking conservation and agriculture, landscape agroecology, agriculture and global climate change, indicators of sustainability, sustainable farm policy and future projections. Available: www.informaworld.com/

Expanding agriculture's roles in the post 2012 regime

This paper examines how agriculture can be effectively included in a post-2012 regime, examining issues related to the concerns of developing and developed countries. The paper explores Canadian considerations and interests in the climate negotiations on agriculture and puts forward a suggested framework for Canada's approach to agriculture in post-2012 negotiations–a framework that aims to increase opportunities for acting on the potential for agricultural greenhouse gas (GHG) emission reductions in developing countries. Available: http://www.iisd.org/pdf/2009/agriculture_post_2012.pdf.

Climate Change Mitigation through Land-Use Measures in the Agriculture and Forestry Sectors

This paper reviews the status of the post-2012 negotiations on climate change mitigation through land-use measures in the agriculture and forestry sectors. These land-use sectors–agriculture and forestry–can potentially play a large role in the global efforts to address climate change under the United Nations Framework Convention on Climate Change, but they are largely excluded from the current international policy framework. The paper examines why these sectors are important, how these issues are addressed in the current negotiations, and what are some of the major issues and considerations when considering their inclusion in a new climate change agreement. The conclusion puts forward questions that will need to be addressed over 2009 as the world moves closer toward elaborating a post-2012 regime for international action on climate change. Available: http://www.iisd.org/pdf/2009/climate_change_mitigation_land_use.pdf.

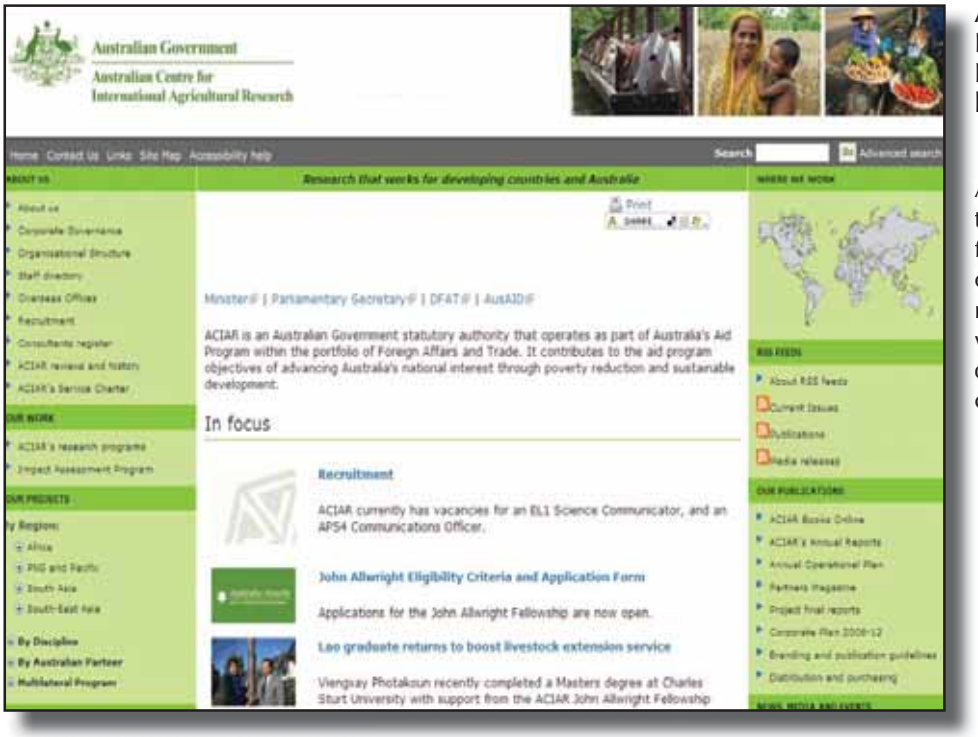
Dead planet, living planet: Biodiversity and ecosystem restoration for sustainable development

Biodiversity and ecosystems deliver crucial services to humankind - from food security to keeping our waters clean, buffering against extreme weather, providing medicines to recreation and adding to the foundation of human culture. Together, these services have been estimated to be worth over 21-72 trillion USD every year - comparable to the World Gross National Income of 58 trillion USD in 2008. Available: http://www.unep.org/publications/contents/pub_details_search.asp?ID=4144.•

Useful Websites

Agroforestry Traditional Tree Initiative
http://www.agroforestry.net/tti/index.html

The Traditional Tree Initiative provides information to strengthen traditional tree-based land use practices, promote sustainable economic development by providing information on underutilized species and their potential crops, enhance the diversity of products and species on agricultural land, protect and expand wildlife habitat in agricultural and residential zones, enhance knowledge of how to use tree resources sustainably, protect the unique culture and ecology of the region, counter risks of bioinvasions from introduced exotics by promoting local species, and conserve the genetic wealth and species diversity of the region by integrating native trees with production.



Australian Centre for International Agricultural Research
http://aciar.gov.au/

ACIAR funds research projects that are developed within a framework reflecting the priorities of Australia's aid program and national research strengths, together with the agricultural research and development priorities of partner countries.

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Useful websites ...

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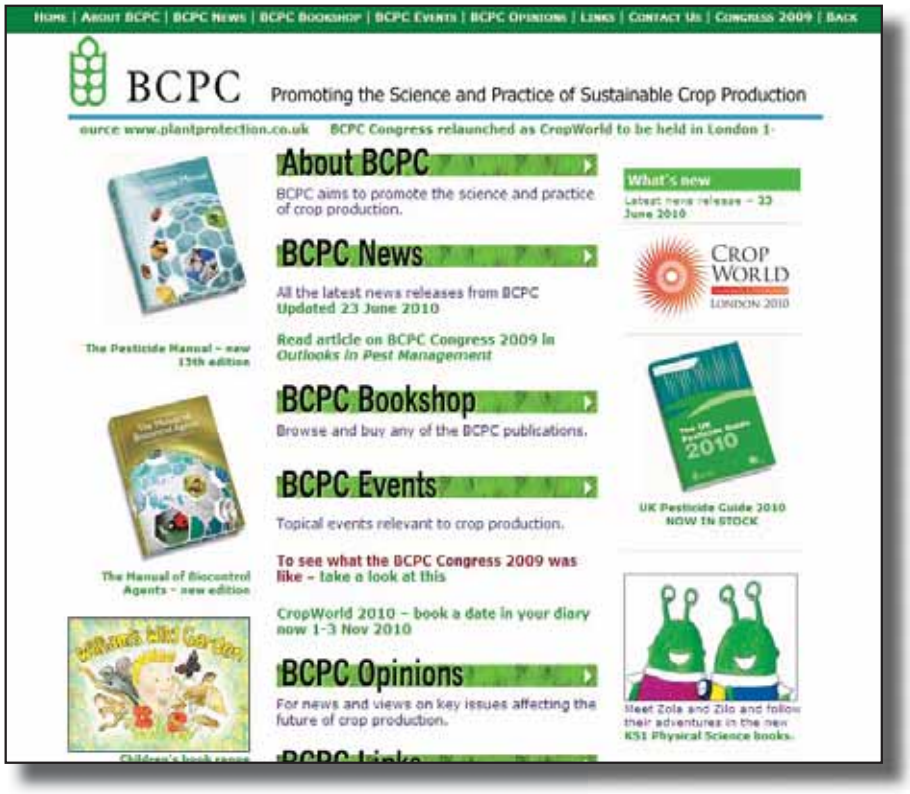
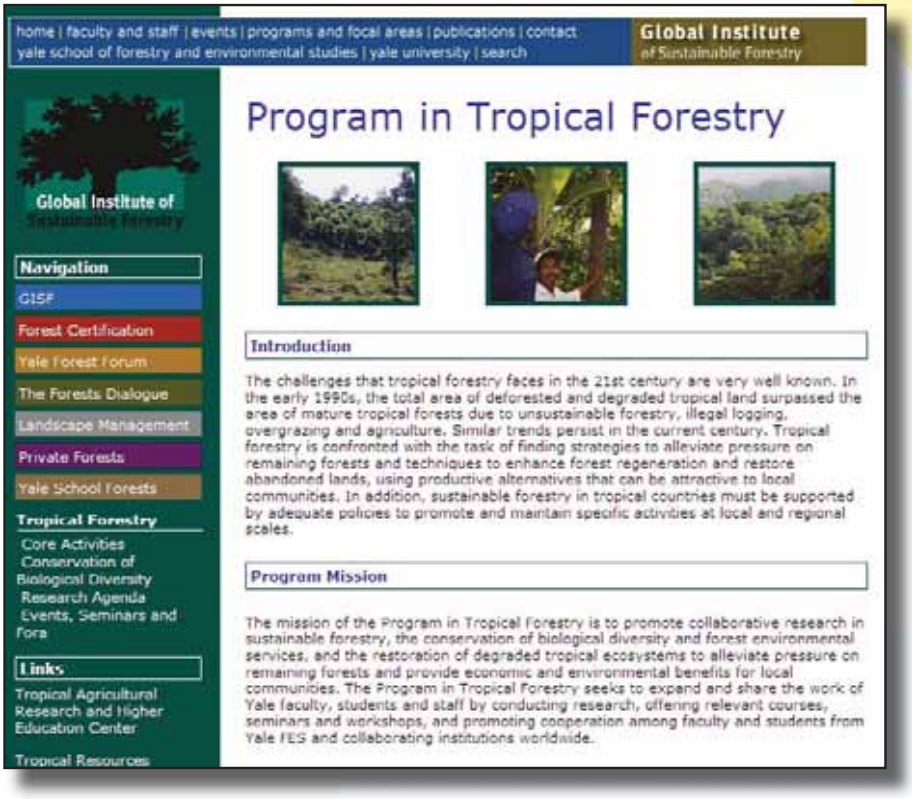
British Crop Production Council
http://www.bcpc.org/

BCPC promotes the use of good science and technology to better understand and apply effective and sustainable crop production. The site offers information on developing issues in the science and practice of crop protection and production; independent analysis and views on these; reference works, manuals and handbooks about the food, fuel and fiber production chain; and conferences and symposia.



International Water Management Institute
http://www.iwmi.cgiar.org/

IWMI is one of 15 international research centers supported by Consultative Group on International Agricultural Research (CGIAR). The site offers information on IWMI's research on four priority themes: water availability and access; productive water use; water quality, health and environment; and water and society. Cross cutting activities in all themes include assessment of land and water productivity and their relationship to poverty; identification of interventions that improve productivity as well as access to and sustainability of natural resources; assessment of the impacts of interventions on productivity, livelihoods, health and environmental sustainability.



Global Institute of Sustainable Forestry
http://gisf.research.yale.edu/ptf/index.html

The site offers research information about the rescue, propagation, conservation and use of native tree species; silviculture and environmental services of mixed and pure plantations of native species for sustainable development in rural areas of the humid tropics; and strategies for the recovery of biodiversity in degraded ecosystems through natural regeneration in mixed and pure plantations of native species in humid tropical lowlands.

Women, Food, and Agriculture Network
http://www.wfan.org/Women,_Food_and_Agriculture_Network_Home.html

WFAN is a community of women involved in sustainable agriculture. The site offers information, connections and encouragement that women need to be effective practitioners and supporters of sustainable agriculture and healthy localized food systems. Topics focus on sustainable agricultural and community structures, social and ecological justice, education opportunities, and networks and communities of support. •

Call for Contributions

We are inviting contributions for the 38th and 39th issues of the Asia-Pacific Agroforestry Newsletter (APANews) on or before 28 February and 30 June 2011, respectively.

Contributions may focus on activities that highlight agroforestry research, promotion and development, and education and training.

Topics of particular interest are on agroforestry and:

- poverty alleviation;
- livelihood;
- farmers' income;
- mining area rehabilitation;
- climate change;
- biodiversity conservation;
- desertification; and
- other key development issues.

Announcements on new information resources, and useful websites are also welcome. Interested contributors must keep the articles straight and simple to cater to as many audiences as possible. Limit your contributions to 1 000 to 1 500 words. Include good-quality photographs (scanned at 300 dpi) that are properly labeled and referred to in the text. Indicate your complete contact details, especially your E-mail address, in the article for readers to contact you should they have further inquiries about your article.

Send your contributions through E-mail to the UPLB Institute of Agroforestry, 2/F Tamesis Hall, College of Forestry and Natural Resources, UP Los Baños, PO Box 35023, College, 4031 Laguna, Philippines; Fax +63 49 5363809; E-mail fao_apanews@yahoo.com and apanews0718@gmail.com.

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