INCREASING MEDICINAL PLANT DIVERSITY IN AGROFORESTRY MODELS AT GUNUNG WALAT EDUCATIONAL FOREST (GWEF) SUKABUMI, WEST JAVA

By

Iskandar Z. Siregar[1], Sri Wilarso Budi R[1], Andi Sukendro[1], Nurheni Wijayanto[1] and Supriyanto[1]

[1]Laboratory of Silviculture, Department of Silviculture, Faculty of Forestry Bogor Agricultural University. Kampus IPB Darmaga P.O.Box 168 Bogor, West Java, Indonesia. Phone: 62-251-8624065, E-mail :wilarso62@yahoo.com

Abstract

This paper presents a planting trial of medicinal plants at Gunung Walat Eduational Forest (GWEF). A trial in randomized completely block design (RCBD) was carried out in two plots inside GWEF, aiming at determining suitable medicinal plant species for agroforestry system. Results showed that two species (Kumis Kucing and Temu Lawak) performed better survival rates (more than 90%) than two others (Sambiloto and Mahkota Dewa). In this experiment, Mahkota Dewa showed the lowest survival rate (78.67%-83.67%). Selection of suitable species for increasing biodiversity in agroforestry should consider the adaptability of the target species in the new environment.

Keywords: Medicinal plants, agroforestry, species trials, biodiversity.

Introduction

Maintaining multiple functions of agroforests is now being extended through increasing plant diversity. As a determining factor of on-site productivity, existing biodiversity in agroforests needs to be managed adaptively especially with respect to the local needs. Lessons learned from the first phase of agroforestry development in Gunung Walat Educational Forest (GWEF) showed that existing agroforestry models in this forest needs to be enriched among otherby medicinal plant species.

People in the world still depend to some extent on medicinal plants for their daily health care. This condition shows that function and strategically advantages of medicinal plant species was extremely high to efforts of healing people from diseases. Benefits of using medicinal plants for raw material of modern medicine, traditional medicine ("jamu" or herbal products) and traditional cosmetics have become more popular than before. This situation made difficult condition to find out sufficient quantity of medicinal plants as raw materials. Heyne (1950) *in* Latumahina (2008) recorded more than 1000 species of medicinal plants in Indonesia. This situation opens up opportunity to society, especially people near the forests, to develop their own sources of medicinal plants through incorporation in the locally available agroforestry models. Benefits of developing medicinal plants especially for people near the forest were income, increasing prosperity, natural resources conservation, informal education, sustainable daily work and employment as well as social security.

Introduction of medicinal plant species in agoforestry models has not been really carried out due to lack of information on the species suitability and therefore a planting trial of selected medicinal plant species to be carried out. Planting trials were conducted with aims at determining suitable medicinal plant species. In the long run, planting medicinal plant species in agroforests will encourage local people to do a replication and is perhaps as an alternative future source of adapted planting stocks.

Materials and Methods

Two plots inside GWEF were selected for the trial. Four medicinal plant species of different therapheutic uses propagated from seedling (Table 1 and Figure 1), namely i) Kumis Kucing (*Orthoshipon aristatus*), ii) Sambiloto *(Andrographis paniculata Ness*), iii) Temu Lawak (*Curcuma xanthorhiza* L.) and iv) Mahkota Dewa *(Phaleria macrocarpa*) were planted in three blocks inside Gunung Walat Educational Forest (GWEF).

Tabel 1 Species of medicinal plants used in the trial and their specific uses

No	Local name	Latin name	Used plant parts	Propagation Technique	Therapeutic uses
1	Kumis Kucing	*Orthoshipon aristatus*	Leaf	Seedling	Diuretic, Rheumatic
2.	Temu Lawak	*Curcuma xanthorhiza* L.	Rhizome	Seedling	Herbal, antiacne
3.	Sambiloto	*Andrographis paniculata Ness*	All parts	Seedling	Antibody
4.	Mahkota Dewa	*Phaleria macrocarpa*	Fruit	Seedling	Antioxidant

The experimental trial in Randomized Completely Block Design (RCBD) was established to monitor mainly the survival rate of the planted species. All of the planting materials of medicinal plant species were prepared through seedling propagation methods. Initial numbers of planting materials for each species were presented in Table 2. They were planted in 36 square tree plots with planting distances of 1 m x 1 m in February 2008 (Figure 5.2) and subsequently maintained, i.e. fertilization, before being assessed in terms of survival (%S) in May 2008. Data were transformed into arcsine √%S and then subjected to analysis of variance (ANOVA) using Minitab Release 14 (Mattjik and Sumertajaya, 2006).

Tabel 2 Initial number of individuals from each species planted in two agroforestry plots

No.	Species	Plot 1 (inside GWEF)			Plot 2 (inside GWEF)		
		Block 1	Block 2	Block 3	Block 1	Block 2	Block 3
1	Kumis Kucing (*Orthoshipon aristatus*)	36	36	36	36	36	36
2	Sambiloto *(Andrographis paniculata Ness*)	36	36	36	36	36	36
3	Temu Lawak (*Curcuma xanthorhiza* L.)	36	36	36	36	36	36
4	Mahkota Dewa *(Phaleria macrocarpa*)	36	36	36	36	36	36

(a)

(b)

(c)

(d)

Figure 1 Planting stock materials: a). Sambiloto, b). Temu Lawak, c). Mahkota Dewa and d). Kumis Kucing

Figure 2 Planting activity of medicinal plants inside Gunung Walat Education Forest (GWEF)

Results And Discussion

Average survival data (Table 3) from 4 species (Kumis Kucing, Sambiloto, Temu Lawak and Mahkota Dewa) were calculated and analysed by ANOVA and then tabulated into histogram (Figure 3). Table 4 presents summary of ANOVA analysed based on only one variable (% survival) which was assessed three months after planting. Significant effect of plant species and no effect of block ($p<0.05$) were observed in Plot 1, while no significant effects at all were found in the Plot 2.

Table 3 Average survival (%) of plant species in two plot trials

No.	Species	Plot 1	Plot 2
1	Kumis Kucing (*Orthoshipon aristatus*)	100.00	99.00
2	Sambiloto *(Andrographis paniculata Ness*)	79.67	92.67
3	Temu Lawak (*Curcuma xanthorhiza* L.)	92.33	94.67
4	Mahkota Dewa *(Phaleria macrocarpa*)	78.67	83.67

Table 4 Summary of ANOVA in two plots (P values)

No.	Source of Variation	Plot 1	Plot 2
1	Plant species	0.004**	0.180ns
2	Block	0.078ns	0.270ns

Note: ** = significant at 5% level of confidence; ns = not significant at 5% level of confidence

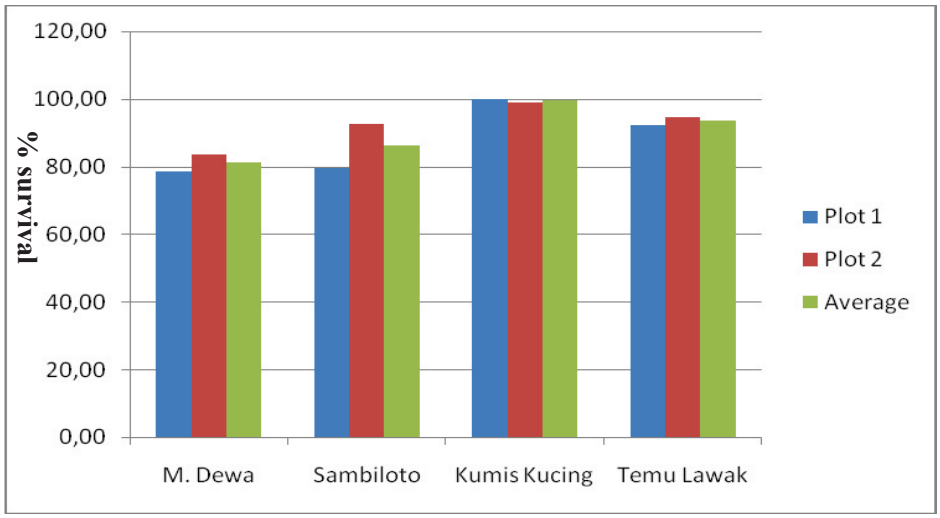

Figure 3 Average survival rates (%) of medicinal plant species in Plot 1 and Plot 2

In general, survival rates of medicinal plants in Plot 2 were better than that of those of Plot 1 (Figure 3). It is clear that initial conditions of sites may influence the plant survivals in which the light intensity of Plot 1 was less than that of Plot 2.

Two plant species (Kumis Kucing and Temu Lawak) performed better survival rates (more than 90% at both blocks) than two other species (Sambiloto and Mahkota Dewa). Mahkota dewa had the lowest survival, 78.67% and 83.67%, in Plot 1 and Plot 2, respectively, while Sambiloto showed actually much better than Mahkota Dewa that is around 79.67-92.67% survival. Examples of field performance of plant species are presented in Figure 4.

Figure 4 Performances of Kumis Kucing and Mahkota Dewa inside GWEF (Up) and Temu Lawak and Sambiloto (Below) three months after planting.

In this experiment, the good growth performance of Kumis Kucing is interesting to be noted. Growth conditions for Kumis Kucing were determinated by full sun light and medium to high air temperature. Shading will decrease leaf extraction level (Anonym, 2008a). The most simple propagation technique for Kumis Kucing is through vegetative propagation such as stem cutting or branch cutting. On the other hand, Temu Lawak can naturally grow both on tree covered lands and open areas. This medicinal plant has a high adaptation to different types of weather in tropical climate (Anonym, 2008b). A possible propagation technique for Temu Lawak is practiced by rhizome.

With regards to agroforestry development in GWEF and its surrounding areas, there are a great potential for extended cultivation and development of some medicinal plant species. This situation gives

opportunities for development of medicinal plants in form of small and medium enterprises near the forests. However, the prices of medicinal plants in the market seem unstable. These conditions cause some farmers to be unwilling for planting medicinal plants. In addition, lack of skills and knowledge on the cultivation techniques of medicinal plants have contributed to the development progress of this potential sub-sectors.

Conclusion

Kumis Kucing and Temu Lawak showed better survival rates compared to Sambiloto and Mahkota Dewa. In particular, there is still a need to further develop and improve cultivation techniques for medicinal plant species in order to increase quantity and quality of medicinal plants.

References

Anonym. 2008a. Kumis Kucing (*Orthoshipon* spp.). http://www.warintek.ristek.go.id/per-tanian/kumis_kucing.pdf. [06 Juni 2008]

Anonym. 2008b. Temulawak (*Curcuma xanthorrhiza* ROXB.). http://www.war-intek.ristek.go.id/pertanian/temulawak.pdf. [06 Juni 2008]

Dephut. 2008. Peranan Tanaman Obat dalam Pengembangan Hutan Tanaman (*The Roles of Medicinal Plants on Plantation Forest Development*). www.dephut.go.id. [06 Juni 2008]

Latumahina, F. S. 2008. Peranan Tanaman Obat Dalam Pengembangan Hutan Dan Strategi Pemanfaatannya Secara Lestari. www.hotlinkfiles.com/files/1221412_sbcwp/ TANAMAN_OBAT.doc. [06 Juni 2008]

Mattjik A. A and I. M. Sumertajaya. 2006. Perancangan Percobaan dengan Aplikasi SAS dan Minitab. IPB Press. Bogor.

Roostika, *et al.*. 2007. In Vitro Culture Manipulation on Pruatjan for Secondary Metabolite Production.http://www.indobiogen.or.id/terbitan/agrobiogen/abstrak/agrobiogen_vol3_no2_2007_55-59.php. [06 Juni 2008]