Bionatura-Jurnal Ilmu-ilmu Hayati dan Fisik
ISSN 1411 - 0903
Vol. 16, No. 2, Juli 2014: 95 - 102

COMPARING MEDICINAL PLANTS USE FOR TRADITIONAL AND MODERN HERBAL MEDICINE IN LONG NAH VILLAGE OF EAST KALIMANTAN

Suharjito, D.,[1] Darusman, L.K.,[2] Darusman, D.[1] and Suwarno, E.[3]
[1]Department of Forest Management IPB Phone: +62 251 8621244; Fax: +62 251 8621256;
[2] Department of Chemistry and Biopharmaca Research Center IPB
[3] Faculty of Forestry, University of Lancang Kuning, Pekanbaru
E-mail: dsuharjito@gmail.com

ABSTRACT

The purpose of this research is to describe the equivalence of local knowledge and scientific knowledge or western knowledge in terms of medicinal plant usage for traditional medicine (TM) or ethnomedicine and modern herbal medicine or jamu (MM), and the recognition of both. This descriptive-comparative research was accomplished using the case study method. The research used participant observation and semi-structured interview techniques to collect data and information from traditional healers, community leaders, and villagers. The research results show that on the one hand, local people particularly traditional healers (dukun) have developed knowledge of medicinal plants and TM compounds. This knowledge has been based on the existence of illnesses in the community and availability of medicinal plants in their environment. On the other hand, rural community has known, acknowledged, and consumed MM as a complement to TM produced by traditional healers (dukun). Comparison of medicinal plants used for TM and MM is not appropriate to prove the equivalence of local knowledge and scientific knowledge, because different plant species may have the same efficacy. On the other hand, different local communities may use different plants with similar efficacy for TM. Likewise, different MM industries may use different plants for MM to have the same efficacy.

Key words: Local knowledge, ethnomedicine, medicinal plants, NTFPs, East Kalimantan Indonesia

ABSTRAK

Penelitian ini bermaksud untuk menunjukkan kesejajaran pengetahuan lokal dan ilmiah atau Barat dalam hal ramuan obat tradisional penduduk lokal (OTPL) dan ramuan jamu industri moderen (JIM), dan saling pengakuan di antara keduanya. Metode yang digunakan pada penelitian ini adalah studi kasus dengan tipe penelitian deskriptif-komparatif. Data dikumpulkan melalui pengamatan dan wawancara semi-terstruktur dengan pembuat ramuan OTPL (dukun), tokoh masyarakat, dan warga dusun. Hasil penelitian menunjukkan bahwa pada satu pihak, masyarakat lokal khususnya peramu obat tradisional (dukun) telah mengembangkan pengetahuan tentang tumbuhan berkhasiat obat dan OTPL. Pengetahuan ini dikem-bangkan dari keberadaan penyakit yang diderita oleh warga masyarakat dan ketersediaan tumbuh-tumbuhan berkhasiat obat di sekitarnya. Pada pihak yang lain, masyarakat pedesaan telah mengenal, mengakui dan menkonsumsi JIM sebagai alternatif atau komplementer dengan OTPL yang diproduksi oleh ahli obat tradisional setempat (dukun). Perbandingan penggunaan tumbuhan sebagai bahan ramuan OTPL dan JIM tidak dapat dilakukan untuk membuktikan kesetaraan pengetahuan lokal dan pengetahuan moderen, karena tumbuhan yang berbeda dapat mengandung khasiat yang sama. Sebaliknya, masyarakat lokal yang berbeda menggunakan tumbuhan yang berbeda untuk ramuan OTPL yang berkhasiat sama. Demikian pula industri jamu yang berbeda menggunakan tumbuhan yang berbeda untuk JIM yang berkhasiat sama.

Kata Kunci: Pengobatan tradisional, pengetahuan lokal, tumbuhan obat, hasil hutan bukan kayu, Kalimantan Timur Indonesia

INTRODUCTION

Background

Plants with medicinal value and compounds of traditional medicine receive continuous attention from researchers. There are at least three reasons which encourage research on such a subject. The first reason is that plants with medicinal value which are collected from the forests constitute one kind of non timber forest products (NTFPs). These are abundant and could serve as alternative sources for reducing the pressure from logging on forests. The second reason is that modern medicines are expensive and difficult to be obtained by poor rural people. The third reason is that, local people who live inside and around the forests possess traditional knowledge or local knowledge concerning use of plants with medicinal value (or medicinal plants, in brief) for various kinds of ailments and diseases. The use of local knowledge on medicinal plants and development of traditional medicine could strengthen the role of local people in managing and conserving forest resources. Strengthening the role of local people in development of traditional medicine could improve the community economy and also improve the people's access to health care (Muthu *et al*., 2006; Birhan *et al*., 2011).

Research in Indonesia has provided information on plant names used in ceremonies or traditional rituals (without describing their merits and meaning); similar research on the names of plants used for food, construction, medicines (without mentioning the beneficial effects), handicraft raw materials, and art instruments have all been conducted for instance on the Baduy community and Siberut community (Hilwan, 1995; Waluyo and Abdulhadi, 1995). Irawan *et al*., (2006) have specifically studied the nutrient contents of plants which are collected from forests and cultivated in gardens, which are used as vegetables by Dayak community in Central Kalimantan. Research on use of plants for medicine which mentioned plant parts being used (leaves, bark, wood, fruits, roots, sap, flower, seed, tuber and rhizome), processing techniques, and their beneficial effects, have been conducted for instance on cases of people community around Pananjung Pangandaran Nature Reserve, Bolaang Mangondow community, and Ambon community (Zuhud and Yuniarsih, 1995; Nasution, 1995; Sangat-Roemantyo, 1995). Even in communities in

Bandung, Subang, Sukabumi, and Bogor, there had been descriptions of medicinal compounds or materials being used and their composition (Iskandar *et al*., 1995).

Research on medicinal plants and compounds of traditional medicine have been conducted in various countries of Asia, Africa, Latin America and other parts of the world (Muthu *et al*., 2006; Birhan *et al*., 2011; Subitha *et al*., 2011; Pradhan and Badola, 2008; Ali-Shtayeh *et al*., 2008; Grønhaug *et al*., 2008). Research has focused not only on local knowledge and compounds of traditional medicine, but also on testing and acknowledgement of such local knowledge, by modern science and knowledge. Achmadi *et al*., (2006) tested *akar kuning* (literally meaning "yellow root") (*Arcangelisia flava* (L) Merr.) as hepatoprotector for hepatitis diseases; Berlin *et al*., (1996) studied diseases which are commonly suffered by Mayan people in Mexico (specifically gastrointestinal and respiratory condition), causes of diseases, utilization of medicinal plants, and testing of bioactive material contents and their pharmacological effects (Berlin, 1999a; Berlin, 1999b); Folashade *et al*., (2011) analyzed phytochemical and pharmacognostic parameters of the leaf of *Hypoestes rosea*, an antimalarial wonder plant, for standardization of its use as a drug. Calvet-Mir *et al*., (2008) explained the practice of utilizing local knowledge of traditional medicine among a Tsimane' community in Bolivia. Their knowledge was combined with western or scientific knowledge, particularly for treating stomach, intestinal or digestive illness (gastrointestinal disease). They found a willingness of local community and modern physicians (doctors) to cooperate and combine their knowledge.

However the research has not thoroughly observed that the rural people or people in inland areas have come in contact with traditional herbs or medicines which are produced by industry on the basis of scientific knowledge (which is henceforth referred to as modern medicine). Consumption of modern medicine by rural people showed the acknowledgement by rural people of modern medicine, while also showing change of choice and behaviors.

The knowledge that a community has developed shows such a close relation between human beings and their environment. Knowledge of medicines which was being developed by a community, was initiated by occurence of illness suffered member of the community and by the availability of plants with medicinal effects in the surrounding areas. Therefore, the existence of traditional medicine compounds using plants as raw materials, provides hints about the types of ailments and diseases which commonly occur in the community, and the availability of the relevant plants in the particular area. On the other hand, local people have also come in contact with, and even consumed medicines, which are produced by industries or modern medicines.

The objectives

This research was intended to show the parallel situation between local knowledge and modern knowledge, and reciprocal acknowledgement between the two kinds of knowledge toward each other. In relation with that, the objective of this research comprised the following items: (1) making comparison between traditional medicinal compounds of local people (*TM*) and herbal medicine which was produced by modern industry (*MM*), and (2) describing acknowledgement and adoption of *MM* by a local community. Comparison between the two medicinal compounds could show the parallel situation between local and modern knowledge, and acknowledgement and adoption by modern community, toward local knowledge. On the other hand, consumption of MM by local people showed acknowledgement and adoption by local people toward modern knowledge.

METHOD OF RESEARCH

Theoretical Framework

Slikkerveer and Slikkerveer (1995) explained that for centuries, herbal medicines (plants and spices) have been the main source of healing in the native healing systems (the indigenous medical systems) in Indonesia. For centuries, different ethnic groups have developed and adapted systems of healing knowledge (medical knowledge systems) for health maintenance, disease prevention and the practice of healing. According to Slikkerveer and Slikkerveer (1995) a new approach toward the study of the Indonesian situation requires specific geographical and historical classification. The existence of differences in perception and practices of healing in Indonesia could be classified as comprising local systems of healing (the local medical systems, in this case, comprising native medicine, derived among other things from ethnic groups from Java, Sunda, Madura, Bali, and Bugis), regional system of healing (the regional medical systems, for instance traditional healing from China and India), and cosmopolitan healing system (the cosmopolitan medical systems which comprise modern or scientific medicines, are introduced from the western community. These systems have undergone interaction, through acculturation processes during the course of history, varying between hierarchical and egalitarian traditions. These systems can be studied as great traditions and as the common people's systems, which are considered little traditions (Redfield, 1971). Such interaction creates configuration of complex healing system (Slikkerveer and Slikkerveer, 1995).

Scoones and Thompson (1994) contested the assumption that one could sensibly contrast local people's knowledge (which possessed very specific characteristics, was contextual and emerged from practical and local knowledge) and western knowledge (which was based on theory, objective, and could be generalized). Rural people also performed emprical testing on alternatives, which shows the existence of a progressive learning process. Local people's knowledge is not static, not a simple collection from knowledge that has been socially and environmentally constructed. Local people's knowledge, as well as western knowledge, could involve a cumulative exploration from alternative practices; it could perform progressive and adaptive learning processes through hypothesis formulation and methodologies which could be replicated. Furthermore Scoones and Thompson (1994) stated that local people's knowledge and western knowledge are both general and specific, theoretical and practical, contain many values (value-laden), are context-specific, and influenced by social power relations.

Research Method

This research used the case study method in a descriptive and comparative way (Sarantakos, 1993; Berg, 2007) in the community of Belwen hamlet, in the village of Long Nah, subdistrict of Muara Ancalong, district of Kutai Timur. This village was selected as a research site due to considerations of ease of access, existence of the Kutai ethnic group and Basap Dayaks with their tradtional culture still intact, including utilization of forest plants as raw materials for medicinal compounds.

Identification of the names of diseases suffered by local people was conducted through semi-structured interviews with several informants. Informants were chosen purposively, comprising those who processed ingredients in TM (*dukun* or traditional healer), midwife or *peraji (dukun bayi*), formal public figures (village government officials), and ordinary members of the community. Identitity of medicinal plants from the natural forests and TM presricption information were obtained through semi-structured interviews those who processed the ingredients of TM.

Several compounds of TM were selected on the basis of consideration of local uniqueness and possibility of preserving their raw materials for transport to Bogor to be identified for their species name. Plants which were used as ingredients for TM were collected, with the help of the informants who were experts in local traditional medicine (*dukun*/traditional healer). The informants decided the composition of ingredients (species being mixed, and their volume or quantity) and explained how the materials were processed. On the basis of their experience in applying their compounds to their own community members, the informants explained the use regulations and the average duration of time to reach recovery from the illnesses.

Compounds of modern industrial herbal medicine (MM) which were selected for comparison were the herbal medicines (*jamu*), which were produced by PT. Jamu Ny. Meneer, PT. Jamu Sidomuncul and PT. Jamu Jago. Names of *jamu* packaging were selected on the basis of similarity of their medical effect with those of the TM remedies selected. Medical effects of each *jamu* were depicted on its packaging.

RESULTS AND DISCUSSION

Local People's Traditional Medicine (TM)

Diseases which were commonly suffered by residents of Belwen hamlet were malaria, toothache, fever, stomach ache, syphilis, typhus, diabetes, hypertension, diarrhea/ dysentery, inner injury/ sore skin wound and breathing difficulty/ suffocation. Local people commonly used as many as 128 species found in the location to make medicine compounds. In terms of their habitus, plants which were utilized as medicinal sources comprise trees, herbs, lianas, ferns, shrubs and grasses. Tree was the group mostly used as materials for medicinal compounds, followed in terms of rank by herbs, grasses, lianas and shrubs. On the other hand, ferns were very little used. Plant parts which were used as materials for TM were leaves, stems, bark, fruits, wood oil and young shoots, either singly or jointly. Plant parts which were used most frequently were roots and leaves. In Banggris and Lambing villages in Muara Lawa sub-district and Dilang Puti and Suakong villages in Bentian Besar sub-district, East Kalimantan, Mulyoutami *et al*., (2009) showed that the sap, roots, leaves, young shoots, flowers and bark from many plant species were used in traditional medicines: hypertension, skin sores, intestinal pain, men's tonic, asthma, gynaecological and intestinal problems, hepatitis, toothache etc.

In Belwen hamlet, there were several experts of traditional medicine or *dukun*. Informants who became *dukuns* (18 informants) explained 82 compounds of traditional medicine (TM) commonly used to heal 52 kinds of illness. Dosages of materials being used for medicinal compounds were measured in terms of their quantity or volume. In the dosage measurement of the materials, beside the use of widely known terms, such as blades for leaves, grain or fruit for seed or fruit, there were also the use of local terminology, such as *sekunci* and *setangkup*. *Sekunci* was the measure of grasp within a circle formed by thumb and forefinger. Materials being measured were usually in the form of roots, stems or leaves. On the other hand, *setangkup* was an amount of materials within the cover of one side of the palm of the hand.

To be ready to be used, materials for TM compounds were mostly processed by boiling in water and pounded/ squeezed. Other techniques were soaking in water, burning followed with soaking in water, while there were also materials which were only being pounded. Materials being boiled in water were usually from the group of roots, stems and barks. Boiling of medicinal materials was usually done after the water volume was reduced (on the average to one third of the original volume of water). On the other hand, materials being pounded and squeezed were generally in the form of fresh rhizomes and leaves.

Different plants which have similar medical effect were shown by TM compounds from different community groups. For example, the community of Belwen hamlet used roots of *kayu emos* (*Clausena excavate*) for treating syphilis, while the Dayak community in the villages of Sei Ilay and Beduai (West Kalimantan) used bark of *ngarut* (*Evodia sp*) stem (Wardah and Setyowati, 1995). The community of Belwen hamlet used the leaves of *sanggar banana* (*Musa paradisiaca*) which had turned yellow for treating hypertension, and used the leaves of *serapat muda* (*Embelia coriacea*), grasses *katup burit* (*Kyllinga monochepala*), salt and pepper (*piper nigrum*) for refreshing women's bodies after giving birth to babies (vaginal bleeding period). On the other hand, the people of Ambon and Maluku used wood and leaves of *kayu timun* (*Timonius timon*) or leaves of *kaki kuda* (*Centella asiatica*) for treating hypertension and utilized the rhizome of *mackey* (*Zingiber purpureum*) or stems of *hisa* (*Cymbopogon nardus*) for women's medicine after parturition (Sangat-Roemantyo, 1995). Other medicinal compound were used by the Baduy community as herbal medicines for post parturition condition, namely the compound of the tuber of *kunyit* (*Curcuma longa*) and the leaves of *singugu* (*Cleodendrum serratum*) which were boiled and drunk (Hilwan, 1995).

The people of Belwen hamlet used the roots of *tunjuk langit* (*Helminthostchys zaylanica*), roots of *hui laki* (*Arundina graminifolia*), *enau* (*Arenga pinnata*), and *serapat* (*Embelia coriacea*) for medicine to strengthen people to work. On the other hand, the Baduy people used the leaves of *kecapi* (*Sandorikum koetjape*) and *kisabrang* (*Peronema canescens*), the bark of *lame putih* (*Alstonia scholaris*), the tuber of *lempuyang* (*Zingiber amaricans*), and the heart of *pisang ambon* (*Musa sp*) which were processed and drunk once everyday before breakfast as herbal medicine is reported to have beneficial effects for hard workers. They also used *jambe* (*Areca catechu*), *gula kawung* (*A. pinnata*), and the leaves of *limus* (*Mangifera foetida*) which were eaten together or soaked in hot water and drunk as a tonic (Hilwan, 1995). Differences in plant species being used as raw materials for TM compounds by various communities was partially related with the availability of that plants in nature. The condition of the land and climate affects the growth and existence of plants. However, there are plant species which could grow in a wide range of varying climates and land conditions.

The TM revealed by the *dukun* described above was possibly only a part of the wealth of knowledge in the community concerning medicinal compounds and human health. We found it difficult to obtain explanations from the *dukun* concerning medicinal compounds they made. This was a matter of the 'hidden transcript' of the *dukun* toward outsiders (researchers) due to fear or suspicion (Scott, 1985). Scoones and Thompson (1994) also explained that "knowledge is bound up with action; But what people do is not necessarily what people consciously 'know'"; Knowledge is articulated in many ways. Practical knowledge is possibly not completely articulated.

Not only to the outsider, the dukun does not also share his knowledge to the insider of the village, as Mulyoutami *et al*., (2009) also explained that knowledge about local medicinal plants is not widely known, as such knowledge is held only by traditional healers in the villages; People are concerned that sharing this knowledge may lead to its misuse. However, as Mulyoutami *et al*., 2009 explained, such knowledge may be shared upon payment of *temaai* (gift or offering) in the form of money, cloth, rice or knife.

Comparison between TM and MM

Not all TM compounds could be compared with MM. Of the 82 TM compounds discovered, 13 were selected (Table 1) as examples for being compared with MM. The thirteen compounds were used for treating syphilis and typhus; or were used as male health tonic and tonic for hard work; for treating diabetes, hypertension, diarrhea/dysentery; for increasing woman fertility; treating inner injury/sore skin or wound, post parturition conditions, breathing difficulty/suffocation and for refreshing men's bodies.

In accordance with their beneficial effects and the name of the diseases to be treated, we selected 10 kinds of MM to serve as a comparison, namely men's health tonic, tonic for hard working, medicine for improving women's fertility, medicine for slimming effect, medicine for post parturition, medicine for diabetes, medicine for hypertension, medicine for dysentery, and medicine for breathing difficulty (suffocation).

Table 1. Thirteen selected compounds of TM

Name of illnesses/ medicinal effects	Materials (raw materials)	Fresh weight (gr)	Process	Application regulation.	Duration of medical treatment
Syphilis	• Roots of *kayu emos* (*Clausena excavate*)	339,17	Soaking in hot water.	2x/day Morning-late afternoon	9 days
Typhus	• Root of *kempis* (*Tetrastigma lanceolarium*) along the girth of hip.	403,80	Boiling	2x/day Morning-late afternoon	7 days
Tonics for men	- Shoot of imperata grasses (*Imperata cylindrica (L.) Beauv.*)	26,03	boiling	2x/day Morning –late afternoon	14 days
	- Roots of *tunjuk langit* (*Helminthostchys zaylanica*)	27,77			
	- Roots of *tengkapa* (*Asplenium nidus*)	118,33			
	- Roots of *beloleng* (*Eleusina indica*)	19,40			
	- Roots of coconut (*Cocos nucifera L.*)	37,97			
	- Root of *pinang* (*Areca catechu L.*)	37,26			
	- Root of *enau* (*Arenga pinnata*)	11,85			
	- Root of *hui bini* (*Arundina graminifolia*)	32,68			
	- Root of *serapat* (*Embelia coriacea*)	49,50			

Table 1. Thirteen selected

Breathing difficulty/ suffocation	- Bark of kemuru tree - Root of pandan (*Pandanus sp.*)	17,79 65,18	Boiling	2x/day	14 days
Refreshing men's body	- Root of *kempis* (*Citrus aurantium*) - Root of *tunjuk langit* (*Melastoma affine*) - *kayu singgah laki bini* (*Anisophyllea disticha*)	174,35 76,50 54,41	Boiling	2x/day. Morning –late afternoon	Routine

Note: Data in this table is a part of the Suharjito *et al*., (2005)

Table-1. Thirteen selected compounds of TM (continuation ….)

Tonics for hard working	- Root of *tunjuk langit* (*Helminthostchys zaylanica*)	110,48	boiling	1x/3 days. morning	Routine
	- Root of hui laki (*Arundina graminifolia*)	61,03			
	- Root of *enau* (*Arenga pinnata*)	64,21			
	- Root of *serapat* (*Embelia coriacea*)	211,86			
Diabetes	- Bark of *angit* (*Canangium odoratum*)	137,80	boiling	2x/days Morning-late afternoon	15 days
	- Root of *senduru* (*Melastoma affine D.Don*)	54,63			
Hypertension	- Leaves of *sanggar banana* (*Musa paradisiacal*) which have turned yellow	199,62	boiling	1x/ day. night	14 days
Diarrhea/ Dysentery	- Leaves of nipah (*Nipa fruticans*) for cigarettes	13,84	Roasting, soaking in water, filtering	2-3x/day	1 day
Lack of fertility (for women)	- Roots of *jeruk nipis / lime* (*Citrus aurantifolia*)	53,44	Boiling	2x/days. Morning-late afternoon	30 days
	- Root of *senduru* (*Melastoma affine*)	58,50			
	- Root of *ribu-ribu* (*Anisphyllea disticha*)	24,51			
Slimming effect	- *kulit kedemba* (*Mitragyna speciosa*)	247,73	boiling	2x/day. Morning-late afternoon	Routine
Inner injury/ sore skin wound	- Root of *kayu pusah* (*Cinnamomum iners*)	97,40	Soaking in hot water	2x/day. Morning-late afternoon	15 days
After giving birth to baby/ post parturition/ vaginal bleeding	- Leaves of *serapat muda* (*Embelia coriacea*)	37,19	Rolling and pressing, squeezing	1x/day. Morning, before breakfast	3 days
	- Grasses katup burit (*Kyllinga monochepala*)	29,24			
	- Salt	0,25			
	- Pepper (*piper nigrum*)	0,25			

The ten (10) kinds of MM were produced by the three industries mentioned above. Because not all categories of *jamu* (herbal medicine) had available counterparts for comparison, the number of MMs which were selected was totally 24 (Table 2).

Do medicinal compounds with similar medical effects use the same ingredients? On the basis of information on material composition being used in each package of MM, it turned out that the three *jamu* industries used raw materials, some of which were similar, some of which were different, despite similar advertised medical effects (see Table 3). For example, MM for men's health produced by PT. Jamu Jago, by PT. Ny Meneer, and by PT. Sido Muncul, contained different ingredients, but there were similar ingredients with relatively similar proportions, namely *Zingiberis rhizoma*. Plant parts being used as compound ingredients were fruit (*fructus*), leaves (*folium*), and rhizomes.

Differences in terms of plants (in the form of *simplisia*) being used for the main ingredients of MM which have relatively similar medical effect, showed that there was diversity of plant species which have similar medical effects. Companies of the *jamu* industry choose materials on the basis, for example, of supply and demand of the materials, location, continuity of supply, price level, consumer's taste, and product uniqueness.

On the basis of medical effects mentioned in the packaging, the 10 MMs possessed medical effects which were relatively similar with the 13 TMs. If we compare our results (Tables 1 and 3), we find that plants being used as materials for TM and MM turned out to be different. As has been shown above, the three *jamu* industries also used different plants for MM with similar medical effects. On the basis of such facts, comparison of utilization of plants as materials for TM and MM could not be conducted to prove the equivalence between modern knowledge and traditional knowledge, because different plants could possess similar medical effects.

The verification of equivalence between local community knowledge and modern scientific knowledge, in the case of medicinal compounds with plants as raw materials, at this present time, is best to be conducted through laboratory or clinical tests. Laboratory tests could prove the equivalence and strengthen the acknowledgement by science toward traditional knowledge or local knowledge (see among other things Achmadi *et al*., 2006; Berlin *et al*., 1996). On the other hand, acknowledgement toward science by local community was shown by the use of scientific products (in this case, MM) by the local communities. The people of Belwen hamlet have consumed herbal medicines ***(jamu)*** which have been produced by modern industry (MM), besides also consuming TM. Traditional shops in the villages have started to sell modern *jamu*. Therefore, rural people, including those in Belwen hamlet have undergone acculturation of knowledge concerning MM and TM.

This research result showed that local community has knowledge of medicinal plant and its use for medicine. Their knowledge is very important as part of natural resource management particularly in sustaining forest resouces (SFM). As Tongkul *et al.,* (2013) showed that for traditional forest related knowledge to be fully incorporated in SFM, the communities, who possess this knowledge, must be fully acknowledged, properly consulted and genuinely engaged. While forest resources are very imporant for household nutrition, resilience, and as safety nets (Dewees, 2013).

Table 2. Modern industry herbal medicine (MM) from three factories, categorized on the basis of their uses.

No.	Uses (usefulness)	Name of herbal medicine (*jamu*) from the factories.		
		PT Jamu Jago	PT Ny Meneer	PT Sidomuncul
1	Tonic for men	*Kuat pria*	*Sehat perkasa*	*Kuku Bima TL*
2	Medicine for men's health	*Sehat pria*	*Pria sehat*	*Sehat pria*
3	Medicine for working strength	-	-	*Temulawak*
4	Medicine for increasing women's fertility	-	*Pil Bibit*	-
5	Slimming medicine	*Galian singset*	*Galian singset*	*Galian singset*
6	Medicine for post parturition / vaginal bleeding	*Nifas*	*Jamu Nifas*	*Nifas*
7	Medicine for diabetes	*Diabeta*	*Jampi seni*	*Sari Turas*
8	Medicine for hypertension	*Atensi*	*Akas jantung*	-
9	Medicine for dysentery	*Mejen*	*Jamu mejen*	-
10	Medicine for breathing difficulty / suffocation	*Anik*	*Sesak Napas*	*Sesak Napas*

Table 3. Composition of materials for modern industry *jamu* (MM)

No.	Name of medicine	Composition of materials
1	*Sehat Pria (Jamu Jago),* 7 gram	*Eucalypti fructus* 10 %, *Curcumae rhizoma* 10 %, *Zingiberis rhizoma* 10 %, *Alyxiae cortex* 8 %, *Phylanthi herba* 8 %, others.
2	*Pria Sehat (Ny Meneer),* 7 gram	*Woodfordiae flos* 7 %, *Panduratae rhizoma* 10 %, *Zingiberis rhizoma* 20 %, *Kaempferiae rhizoma* 20 %, others.
3	*Sehat Pria (Sido Muncul),* 7 gram	*Piperis ngri fructus* 10 %, *Retrofracti fructus* 10 %, *Zingiberis aromaticae rhizoma* 10 %, *Cyperi rhizoma* 5 %, *Myristicae pericarpium* 5 %, others.
4	*Kuat pria (Jamu Jago),* 7 gram	*Retrofracti fructus* 8 %, *Eucalypti fructus* 12 %, *Curcumae rhizoma* 12 %, *Zingiberis rhizoma* 8 %, *Phylanthi herba* 8 %, others.
5	*Sehat Perkasa (Ny Meneer),* 7 gram	*Coriandri fructus* 10 %, *Zingiberis rhizoma* 15 %, *Kaempferiae rhizoma* 15 %, *Curcumae domesticae rhizoma* 20 %, others.
6	*Kuku Bima TL (Sido Muncul),* 6,5 gram	*Hippocampus powder* 5 %, *Panax ginseng* 25 %, *Eurycomae radix* 15 %, *Kaempferiae rhizoma* 7 %, *Zingiberis rhizoma* 10 %, *Phyllanthi herba* 4 %, *Zingiberis aromaticae rhizoma* 7 %, others.
7	*Galian singset (Ny Meneer),* 7 gram	*Guazumae folium* 5 %, *Arecae semen* 10 %, *Curcumae aeruginosae rhizoma* 20 %, *Curcumae domesticae rhizoma* 25 %, others.
8	*Galian Singset (Sido Muncul),* 7 gram	*Guazumae folium* 15 %, *Terminaliae fructus* 5 %, *Curcumae rhizoma* 10 %, *Phyllanti herba* 5 %, *Melaleucae fructus* 10 %, others.
9	*Nifas (Ny Meneer),* 7 gram	*Plucheae folium* 5 %, *Piperisbetie folium* 8 %, *Nycthanti flos* 10 %, *Zingiberis aromaticae Rhizoma* 30 %, others.
10	*Nifas (Sido Muncul),* 7 gram	*Curcumae rhizoma* 9 %, *Litseae folium* 5 %, *Zingiberis rhizoma* 5 %, *Catharmi flos* 9 %, *Baeckeae folium* 10 %, others.
11	*a-nik (Jmu Jago),* 7 gram	*Glycyrrhizae radix* 12 %, *Eucalypti fructus* 12 %, *Caryophylli folia* 8 %, *Amomi fructus* 8 %, *Curcumae rhizoma* 8 %, others.
12	*Sesak Napas (Ny Meneer),* 7 gram	*Cardamami fructus* 6 %, *Messuae flos* 8 %, *Cubebae fructus* 20 %, *Curcumae rhizoma* 45 %, others.
13	*Sesak Napas (Sido Muncul),* 7 gram	*Foeniculli fructus* 9%, *Zingeberis aromaticae rhizoma* 9%, *Zingiberis rhizoma* 7 %, *Thymi herba* 5 %, *Caryophylli folium* 4 %, others.
14	*Jampi seni (Ny Meneer),* 7 gram	*Massoiae cortex* 3 %, *Zingiberis rhizoma* 10 %, *Cardamomi fructus* 5 %, *Gunnerae flos* 14 %, others.
15	*Sari Turas (Sido Muncul),*	*Andrographidis herba* 10 %, *Abri folium* 10 %, *Leucaenae glaucae semen* 10 %, *Ligustrinae lignum* 15 %, *Alstoniae cortex* 5 %, others.

CONCLUSION

TM Compounds developed by local people of Belwen hamlet in Long Nah village, constituted an effort to treat and heal the prevailing illnesses and to maintain the health of local people. This phenomenon indicated that the knowledge on plants with medical effect (medicinal values) and TM compounds which were developed by the people were initiated by the occurrence of illnesses and availability of materials with medicinal effect in the surrounding areas. Development of market, including the marketing of *jamu* produced by modern industry (MM), have entered rural areas. Traditional shops in the rural areas have become marketing agent for industry products. Rural communities have known and consumed MM as alternatives or as complements of TM produced by local experts (*dukun*). This phenomenon showed

the acknowledgement and adoption of MM by local people toward modern knowledge. This research compared the compounds of TM with those of MM to show the parallel situation between local and modern knowledge. However, it turned out that comparison of utilization of materials for compounds of TM and MM could not be conducted to prove the equivalence of modern knowledge and local knowledge, because different plants could possess similar medical effect (efficacy). Different local communities (for instance the hamlet of Belwen, Dayak Sei Ilay and Beduai, Maluku and Ambon, and Baduy) utilized different plants for TM compounds with similar medical effects (efficacy). The three jamu industries (PT. Jamu Jago, PT. Ny Meneer, and PT. Sidomuncul) also used different plants for MM which had similar medical effect (efficacy). The use of various plant species as materials for TM and MM compounds showed the very high level of biodiversity of plants.

ACKNOWLEDGEMENTS

The authors are grateful to the Directorate General of Higher Education, Ministry of Education and Culture of Indonesia for financial support through competitive research grant program. The authors must also thank to Dr. Carol J.P. Colfer for her review to this article before submitted to the Bionatura, journal of Life and Physical Sciences.

REFERENCES

Achmadi, S.S., Batubara, I., & Sulistiyani. 2006. Saponins of Albutra (*Arcangelisia flava* (L.) Merr) as a Hepatoprotector. In: Technical Report 2. Promoting selected non-timber forest product based on community participation approach to support sustainable forest management in East Kalimantan. pp. 19-29. Bogor: Biopharmaca Research Center Bogor Agricultural University.

Ali-Shtayeh, M.S., Jamous, R.M., Al-Shafie', J.H., Elgharabah, W.A., Kherfan, F.A., Qarariah, K.H., Khdair, I.S., Soos, I.M., Musleh, A.A., Isa, B.A., Herzallah, H.M., Khlaif, R.B., Aiash, S.M., Swaiti, G.M., Abuzahra, M.A., Haj-Ali, M.M., Saifi, N.A., Azem, H.K., & Nasrallah, H.A. 2008. Traditional knowledge of wild edible plants used in Palestine (Northern West Bank): A comparative study. Journal of Ethnobiology and Ethnomedicine. *http:// www. ethnobiomed.com /content/4/1/13*.

Berg, B.L. 2007. Qualitative research methods for the social sciences. Boston: Pearson Education Inc.

Berlin, E.A., Berlin, B., Lozoya, X., Meckes, M., Tortoriello, J., & Villarreal, M.L. 1996. The scientific basis of gastrointestinal herbal medicine among the highland Maya of Chiapas, Mexico. In: L. Nader (ed.), Naked Science. pp. 43-68. New York & London: Routledge.

Berlin, B. 1999a. Lexical reflections on the cultural importance of medicinal plants among Tzotzil. In: T.L. Gragson & B.G. Blount (eds.), Ethnoecology: Knowledge, resources, and rights. pp. 12-23. Athens: The University of Georgia Pres.

Berlin, E.A. 1999b. Ecological, sociocultural, and biological determinants of ethnoepidemiological patterns among Tzotzil and Tzeltal Maya. In: T.L. Gragson & B.G. Blount (eds.), Ethnoecology: Knowledge, resources, and rights. pp. 57-73. Athens: The University of Georgia Press.

Birhan, W., Giday, M., & Teklehaymanot, T. 2011. The contribution of traditional healers' clinics to public health care system in Addis Ababa, Ethiopia: a cross-sectional study. Journal of Ethnobiology and Ethnomedicine. *http:// www.ethnobiomed.com/content/7/1/39*.

Calvet-Mir, L., Reyes-García, V., & Tanner, S. 2008. Is there a divide between local medicinal knowledge and western medicine ? a Case study among native Amazonians in Bolivia. Journal of Ethnobiology and Ethnomedicine. *http:// www.ethnobiomed.com/content/4/1/18*.

Dewees, P. 2013. Forests, Trees and Resilient Households. Unasylva 241, Vol. 64 (2): 46-53.

Folashade, K.O., Bonaventure, A.M., Ehiabhi, O.S., Adeola, J.I., & Okogun, J.I. 2011. Phytochemical and pharmacognostic standardization of the leaf of *Hypoestes rosea* P. Beauv Acanthaceae. Int. Res. J. Plant Sci., 2 (11): 323-327. *http://interesjournals.org/ IRJPS/Pdf/2011/November/Kunle%20et%20 al.pdf.*

Grønhaug, T.E., Glæserud, S., Skogsrud, M., Ballo, N., Bah, S., Diallo, D., & Paulsen, D.B. 2008. Ethnopharmacological survey of six medicinal plants from Mali, West-Africa. Journal of Ethnobiology and Ethnomedicine. *http:// www.ethnobiomed.com/ content/4/1/26*.

Hilwan, I. 1995. Sekilas tentang etnobotani Suku Baduy di Banten, Jawa Barat. Prosiding seminar dan lokakarya national ethnobotani II, Yogyakarta 24-25 Januari.

Irawan, D., Wijaya, C.H., Limin, S.H., Hashidoko, Y., Osaki, M., & Kulu, I.P. 2006. Ethnobotanical study and nutrient potency of local traditional vegetables in Central Kalimantan. TROPICS, 15 (4): 441-448.

Iskandar, M.I., Ismanto, A., & Anggraeni, I. 1995. Pemanfaatan tumbuhan obat dari hutan oleh suku Sunda. Prosiding seminar dan lokakarya national ethnobotani II, Yogyakarta 24-25 Januari.

Mulyoutami, E., Rismawan, R., & Joshi, L. 2009. Local knowledge and management of simpukng (forest gardens) among the Dayak people in East Kalimantan, Indonesia. Forest Ecology and Management, 257: 2054–2061.

Muthu, C., Ayyanar, M., Raja, N., & Ignacimuthu, S. 2006. Medicinal plants used by traditional healers in Kancheepuram District of Tamil Nadu, India. Journal of Ethnobiology and Ethnomedicine. http://www.ethnobiomed.com/ content/2/1/43.

Nasution, R.E. 1995. Aneka ragam tumbuhan obat tradisional serta cara pemanfaatannya oleh suku Bolaangmangondow di sekitar Kotamobago, Sulawesi Utara. Prosiding seminar dan lokakarya national ethnobotani II, Yogyakarta 24-25 Januari.

Pradhan, B.K. & Badola, H.K. 2008. Ethnomedicinal plant use by Lepcha Tribe of Dzongu Valley, Bordering Khangchendzonga Biosphere Reserve, in North Sikkim, India. Journal of Ethnobiology and Ethnomedicine. *http://www.ethnobiomed.com/content/4/1/22*.

Redfield, R. 1971. The little community, and Peasant society and culture. Chicago: University of Chicago Press.

Sangat-Roemantyo, H. 1995. Pengetahuan tentang pengobatan tradisional di daerah Ambon dan Maluku. Prosiding seminar dan lokakarya national ethnobotani II, Yogyakarta 24-25 Januari.

Sarantakos, S. 1993. Social Research. South Melbourne: Macmillan Education Australia Pty Ltd.

Scoones, I. & Thompson, J. 1994. Knowledge, power and agriculture: Towards a theoretical understanding. In: I. Scoones, & J. Thompson (eds.), Beyond Farmer First: Rural People's Knowledge, Agricultural Research and Extension Practice. pp. 16-32. London: Intermediate Technology Publications Ltd.

Scott, J.C. 1985. Weapons of the weak: Everyday forms of peasant resistance. New Haven: Yale University Press.

Slikkerveer, L.J. & Slikkerveer, M.K.L. 1995. Taman obat keluarga (TOGA): Indigenous Indonesian medicine for self-reliance. In: D.M. Warren, L.J. Slikkerveer, & D. Brokensha, The Cultural Dimension of Development, Indigenous Knowledge Systems. pp. 13-34. London: Intermediate Technology Publications.

Subitha, K., Ayyanar, T.M., Udayakumar, M., and Sekar, T. 2011. Ethnomedicinal plants used by Kani tribals in Pechiparai forests Southern Western Ghats, Tamil Nadu, India. Int. Res. J. Plant Sci. 2 (12): 349-354. *http://interesjournals.org/IRJPS/Pdf/2011/December/Subitha%20et%20al.pdf.*

Tongkul, F., Lasimbang, C., Lasimbang, A., & Chin Jr, P. 2013. Traditional knowledge and SFM: experience from Malaysia. Unasylva 240, Vol. 64 (1): 41-49.

Waluyo, E.B. & Abdulhadi, R. 1995. Interaksi manusia dan hutan, suatu pendekatan etnobotani: Studi kasus masyarakat Siberut, Sumatra Barat. Prosiding seminar dan lokakarya national ethnobotani II, Yogyakarta 24-25 Januari.

Wardah & Setyowati, F.M. 1995. Penelitian tumbuhan dalam pengobatan tradisional suku Dayak di Kecamatan Beduai Kalimantan Barat. Prosiding seminar dan lokakarya national ethnobotani II, Yogyakarta 24-25 Januari.

Zuhud, E.A.M. & Yuniarsih, A. 1995. Keanekaragaman tumbuhan obat di Cagar Alam Pananjung Pangandaran. Prosiding seminar dan lokakarya national ethnobotani II, Yogyakarta 24-25 Januari.