

DFW
Department of Forestry and Wildlife



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ESTABLISHMENT OF A FORESTRY RESEARCH BASE FOR SUSTAINABLE FOREST MANAGEMENT IN CAMBODIA

PROJECT TECHNICAL REPORT

Submitted by

**Department of Forestry and Wildlife
Ministry of Agriculture, Forestry and Fisheries**

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**"Establishment of a Forestry Research Base for
Sustainable Forest Management in Cambodia**

Phnom Penh, November 2001

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PROJECT TECHNICAL REPORT



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Title of Technical Report: Analysis of Current Capacity of DFW Staff in Forest Management and Forestry Research in Cambodia (Output 1, Activity 1.1)

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I- Abstract

In 1999 ITTO agreed on supporting a Pre-Project on "Establishment of a Forest Research Base for Sustainable Forest Management in Cambodia" with particular attention focused on strengthening human capacities and upgrading technologies for sustainable forest management.

Assessment of the current research capacities of the staff of FWRI is considered as crucial in establishing and operating a research institution. This Technical Report refers specifically to the assessment of the current capacities of DFW-FWRI staff in the fields of Forest Management and Forestry Research.

DFW screened qualifications of the 58 Bachelors of Forestry permanently or temporarily assigned to the FWRI. They are on average 33 years old and graduated 7 years ago. Only few have received any supplementary training since then. Although some 25% of these are highly motivated staff they lack essential scientific and analytical capabilities for conducting research on their own. The observed deficits in the scientific background and lack of practice result from serious structural and conceptual failures of education which begin at primary and secondary school level and continue to affect education at the Faculty of Forestry Science (FFS).

In order to obtain a reliable impression of strengths and weaknesses of the staff and potential requirements with respect to present and future research activities the level of knowledge provided by the Faculty of Forestry Science and the know-how anticipated for implementing the Strategic Forestry Research Plan 2000-2010 have been put into relation.

At present, FWRI staff conducts research activities in forest management, silviculture (gap and line planting), collecting of growth data on permanent sample plots and plantation trials on a very restricted scale because of financial and infrastructure constraints. The limited spatial and scientific scope of these investigations severely restricts the usefulness of any results for forest management policy decisions. The very basic set-up of field research indicates further that there is a need for introducing and training staffs in new technologies of forest management strategies, soil analysis, and plantation and rehabilitation forestry. It must also be noted that no national expertise exists in the field of wood preservation and physical properties of wood and wood-based materials.

After analysis of available information and evaluation of the consultative workshop held in Department of Forestry and Wildlife, the following salient features summarize the present capacity constraints of FWRI staff:

- Of 71 junior and senior staff of FWRI, 3 hold a Ph.D. degrees in Agriculture, Economics and environment, 2 hold a Master Degree in Business Administration, 58 hold a Bachelor of Forestry Degree, 3 are Bachelors of Environment Science, 2 are engineers, 3 are a Technicians in Silviculture (see. table 1)
- However, Bachelors of Forestry having graduated from the Faculty of Forestry of the Royal University of Agriculture are not sufficiently educated in natural sciences to be able to plan, execute and monitor research activities with different forest management systems.
- Bachelors also lack capability and resources for designing, implementing and evaluating experiments and investigations in various forestry and wood technological fields.
- DFW/FWRI do not dispose of any facilities like laboratories, computer center, collections, herbarium, a library and professional journals that staff could use or consult in forestry research activities

It is concluded that the current staff of FWRI is insufficiently qualified and technically under-equipped for conducting research in the priority fields of forest management, general forestry and wood technology. Substantial and structured support in the fields of training, and upgrading of technologies could significantly contribute towards establishment of forestry research capacity at DFW-FWRI.

II- Introduction

This technical report deals specifically with assessing the current capacity of the human resource base of FWRI involved in the establishment and operation of the Forestry and Wildlife Research Institute.

The **Special Objective** of the ITTO-funded Pre-Project has been defined as "To establish a Forest Research Base with full capacity that can serve as an instrument for upgrading technologies in sustainable forest management with particular reference to forest conservation and sustainable forest utilization and building up the capacities in the fields of forest management and forestry research in Cambodia".

The overall situation of FWRI severely restricts the capability of its graduated staff for independent thinking and for developing practical solutions in face of the manifold management and planning needs in the daily work of DFW. Equipped with limited tools an unsuitably educated the potential of staff for conducting research and experiments must be considered as insufficient.

- Collecting and analyzing available information on capacity building of human resources, upgrading technologies and other relevant aspects needed for supporting forestry research in Cambodia.
- Formulating a project proposal for the establishment of a research base in Cambodia.

Besides the FORSPA conference there were no other initiatives or follow-ups made or projects implemented with international donor or ITTO funding in the field of forestry research or introduction of sustainable forest management at the national level.

The significance of the envisioned Project lies in the fact that the Development Objective, i.e., initiating sustainable management of forest resources, is not attainable unless a new, research-based forestry database is being created. This in turn requires a staff of qualified researchers and the necessary research infrastructure. The Pre-Project aims at assessing the needs concerning capacity building of human resources, introduction of new technologies and identifying the infrastructure needs for forestry research in Cambodia to become viable.

In the course of the Pre-Project, available information on human resources was collected, reviewed and analyzed. This concerned the strengths and weaknesses of the high school system as well as university education. Some of the limitations of the professional capabilities result directly from lack of books, teaching aids and teacher training at the Forestry Faculty.

III- Current situation of Forestry Education and Research in Cambodia

The Faculty of Forestry Science (FFS) of the Royal University of Agriculture conducts a course of so far 7 terms, in the future 6 terms leading to the Bachelor of Forestry Science degree. The FFS is chronically undersupplied with financial means for the faculty staff, for books and international scientific journals (none available of the latter) funds for field research and renewal of field equipment. The Faculty lies 20 km outside of Phnom Penh; access during the rainy season and times of flooding is nearly impossible. These infrastructural problems are aggravated by the fact that the faculty has not had any substantial upgrading or post graduate training. Half of their time is spent with private business because the salary of approximately US\$ 50 is insufficient for survival. Last not least, 10 out of Faculty of 14 have been recruited from the graduates of the last eighth years.

In the Faculty of Forestry available copies of textbooks and field instruments in working condition seldom exceed 2-3 in number. Of 144 credits required for graduation 44 are earned in the first year with General Education, comprising history and culture of Cambodia, while not a single profession-oriented subject is taught in the first year. This basic knowledge should be taught at the secondary high schools. The situation is aggravated because the annual budgets allocated to the Forestry Faculty as well as to DFW do not cover the costs of fieldwork, maintenance of experimental sites and permanent sample plots. Thus, the opportunity of acquiring experience by doing is considerably limited and a significant proportion of science taught remains theoretical. Faculty staff is constantly engaged in rounding up funds for equipment, materials and operational costs. This situation severely restricts the capability of graduates for independent thinking and for developing practical solutions in face of the manifold management and planning needs in the daily work of DFW. Equipped with such

limited tools the potential of staff for conducting research and experiments must be considered as insufficient.

Due to the above constraints graduates are judged to be only insufficiently prepared for:

- Problem analysis and pondering alternative solutions for solving complex situations,
- judging the ecological consequences of human interventions,
- developing an understanding for management systems,
- evaluating and planning reforestation operations,
- determining basic wood properties, e.g. specific weight, modulus of elasticity,
- doing wood anatomical studies and species identification using a microscope,
- determining natural durability,
- planning experiments and determining statistical indicators,
- planning silvicultural experiments,
- assuming leadership in research,
- keeping experimental records,
- reporting and publishing results.

While this is not a desperate situation it indicates nevertheless that a comprehensive and cooperative system of capacity building needs to be developed between DFW and participating technical donor assistance projects to upgrade the work force step by step at every level.

1. Sources of information

Reliable facts and figures were difficult to obtain. Main sources of data have been:

- The Ministry of Education, Youth and Sports of Education in cooperation with UNDP and UNICEF published a report on "Educational Indicators" in 1999. This report provides basic information on the educational system, structure and organization in Cambodia.
- DFW provided information on professional qualifications of staff allocated to FWRI. Based on these data a tentative assessment of the capacities of FWRI in forest management and forestry was achieved and a tentative training plan elaborated.
- Specific data were obtained by interviewing relevant officials and experts: the Director of FWRI, team leaders of technical assistance projects from Denmark, Japan and Switzerland, experts of UNDP, FAO and the ADB.
- The Dean of the Faculty of Forestry, Mr. Monin, provided most of the information concerning capacities of the faculty staff, infrastructure and deficits concerning teaching and research activities, books, teaching aids and laboratories. This information was essential in identifying the basic professional qualifications of graduates from the Forestry Faculty and potential supplementary training needs.
- The Draft Strategic Research Plan 2000-2010 conceived by FWRI has been another official source describing expectations and aims of future forestry research activities, manpower, financial and technical requirements and constraints. However, the Ministry of Agriculture, Forestry and Fisheries have not yet authorized this Draft as reference document.

Analysis of the secondary high school system revealed deficits concerning teacher training and upgrading as well as a widespread lack of modern schoolbooks. These negative conditions affect the capacities of high school students to compete effectively for admission to the Royal University of Agriculture. There is also a strong qualitative difference between schools in the capital and outlying provinces where over 80% of the population are living.

Admission to the Royal Agricultural University and specifically the Faculty of Forestry Science requires passing a rigorous test, which only a few master at the first attempt. The secondary high schools do not prepare students sufficiently for this test. The capacity of the Forestry Faculty amounts to 40-60 students per year; up to 10 times more do apply. The report on Educational Indicators published by the Ministry of Education, Youth and Sports in 1999 states that the overall budget for education amounts to 10% of the national budget of US\$400 million. This has not been sufficient to improve school buildings, extend libraries and improve teacher training and salaries on the national and

provincial levels.

These consist in a considerable imbalance between theoretical and practical education, lack of teaching materials and scientific instruments for fieldwork, unsatisfactory salaries and operating funds and lack of senior fully employed faculty staff. Means for upgrading of the staff of the Faculty of Forestry Science are scarce, lecturers hold second jobs to survive and dedicate only 50% of their time and efforts to teaching and student guidance.

1.1 Assessment of current research capacities

In order to obtain an approximate estimation of the current capacities the on-going research activities have been presented by FWRI. They comprise the following projects many of which are executed with the active participation of international scientists. Very often projects arrange for additional training of the Cambodian counterparts during or after project completion to achieve some degree of sustainability.

Presently the following research activities are executed:

- Small-scale plantation trials in Baksna nursery;
- vegetation survey and silviculture experiments on 1800 ha in logged-over forest, Kampong Thom Province;
- growth and yield assessment on 112 permanent samples plots, country-wide;
- extension of the network of permanent sample plots from 112 to 240 (delayed)
- regional survey on great cats in the Cardamom Mountain region;
- Sarus crane habitat protection, 3 provinces;
- identification of seed tree sources, country-wide;
- forest inventory fieldwork on a limited scale;
- wildlife surveys on crocodiles, elephants, tigers in selected habitats.

All fieldwork is carried out on limited budgets and with health and safety hazards for the staff. In remote areas clean water is not available, food is scarce and prophylaxis for malaria is insufficient or lacking for financial reasons.

The reason for these limited activities is not only lack of funding and equipment but also the fact that FWRI staff has little experience in designing and organizing investigations reaching beyond the collection of field measurements. Very little is known about interactions between trees, animals, soil and climate within a forest ecosystem. Without this broader view analysis and interpretation of data the research activity loses much of its attraction. The needed curiosity can only be awakened if forestry education becomes more profound and comprehensive.

With reference to the Draft Strategic Research Plan 2001-2010, (DFW 1999), the Director of FWRI specified the immediate need for staff with specialized and/or advanced training as follows:

a- Long-term Training 2-4 years (Ph.D.level) 3 candidates as senior research scientists

- 1 Silviculturist
- 1 Wood Technologist
- 1 Phytopathologist

b- Medium -Term Training 1 – 3 years (Master of Science level) 5 candidates as research project leaders

- 1 Community Forestry-Co-Management specialist
- 1 Sociologist, rural community appraisal expert
- 1 Wildlife Management specialist
- 1 Reforestation/Nursery specialist
- 1 Entomologist/mycologist/forest protection specialist
- 1 Information Technology (IT)-Database specialist

c- Short term training, 0.25 to 1 year (engineer, technician, and skilled worker level)

- 3 technical staff for microscopic work, soil laboratory, botanical collection
- 1 nursery engineer
- 2 nursery technicians
- 5 skilled forestry workers

1.2 Assessment of research potential

The Management of DFW-FWRI exhibits a positive attitude in encouraging staff to apply for fellowships and in granting leave for advanced education. But at the same time it is the most active staff members who shall be rewarded for their above-average performance. Their departure for one-to two years invariably leads to a depletion of intelligent resources in the Department.

A distinction will be made between the professional and the technical research potential. Bachelors of Forestry graduating from the Faculty of Forestry Science (FFS) make up the bulk of FWRI staff. Due to significant conceptual and technical deficits at FFS Bachelors are not sufficiently qualified for doing forestry or wood technological research without further qualification. Although the curriculum lists 34 compulsory, another 17 optional important forestry subjects and 2 language courses, the faculty is not in a position to teach each subject offered. Many fields are treated only superficially. Instead of releasing forestry generalists, a pragmatic approach based on the specific needs of the forest management and forest industries sectors would produce graduates with a more specific orientation and with the knowledge needed to work confidently in these priority sectors. With regard to the core staff assigned to FWRI the staff forms a broad-base pyramid of bachelors with a very small leadership level. The subsequent table reveals the young age of the staff members and the absence of middle and older aged leaders.

Presently, FWRI comprises a work force of 71 members. (Numbers are varying because some staff is temporarily "borrowed" by MAFF for special tasks or they are transferred to technical assistance projects as counterpart staff). According to information supplied these 71 persons comprise 3 Ph.D. degrees, 3 Masters degrees, 58 Bachelor of Science degrees, 3 engineers and 4 technician level employees. The bachelor level staffs are on the average 33 years old and have graduated 7 years ago. The "senior" staffs, Section Heads and Chiefs of Offices, are on average only 5 years older. Only 3 out of 71 staff members with a higher education are women (see table 1).

Table 1: Professional qualification and age groups of FWRI Staff

No.	Age Class (Years)	Qualification						Total	Percent
		PhD	Masters	BScF	BSc	Eng.	Techn.		
1	> 25	1		9	2	1	2	15	21
2	>30	1	1	28		2	1	33	47
3	>35		2	4	1			7	10
4	>40				1			1	1
5	>45	1					1	2	3
6	Unknown			13				13	18
Total		3	3	54	4	3	4	71	100
Percent		4	4	76	6	4	6	100	

The assessment of current research capacity is based on evidence related to promotion and salary increases. New graduates start in Salary group 1 and advance after 3-4 years to group 2. Here they remain unless they excel in their efforts and results or acquire a higher degree through evening school or study abroad. Only 11% have been promoted into groups 3 to 6, one female employee with a Ph.D. degree is in group 5 (See table 2). It is not known whether lack of funds slows down promotion or not. But given the low level of salaries and the dismal salary increases given with promotions this cannot be the only reason. Increases in salary cannot be considered as an incentive for high performance, but imply rather the chance of being granted leave or preferential status in the allocation of fellowships for studying abroad.

Table 2: Year of graduation and salary group of 71 graduated staff of FWRI

Year of graduation	Salary Group						Total staff	Percent
	1	2	3	4	5	6		
<1990						1	1	1
1990		2	1				3	4
1991		3	1				4	6
1992		3	0		1		4	6
1993		7	1				8	11
1994	1	18		1			20	28
1995	2	6					8	11
1996	1	1					2	3
1997	1	1					2	3
1998		0		1			1	1
1999		2					2	3
2000		1					1	1
2001		2					2	3
unknown	6	6	1				13	19
Total	11	52	4	2	1	1	71	100
Percent	16	73	6	3	1	1	100	

It is not possible to draw any conclusion on the research capacity from the above two tables, because evaluation of the intellectual and professional performance and creativity are not yet made. Although no accurate figures could be obtained, it is estimated that only 25% of annual work can be dedicated to research activities because of inadequate operational funding.

Promotion of staff in DFW is partly based on the degree of education and partly on work accomplished, efforts made and willingness to work beyond the normal requirements. About every three years Deputy Directors discuss merits and weaknesses of middle level employees. Because of training cost involved, they select individual staff not for advanced training and promotion but for a raise in the salary level (increases range below US\$ 10/months or roughly 10%/year on the base salary of US\$35/month for a Bachelor of Science.). At this income level it is impossible to support a family, let alone to buy scientific books or attend evening school for continuing education. Those who manage to attend classes are sponsored by international projects or receive monetary assistance from relatives living abroad. All others are forced to hold second jobs, which reduces their energy and inputs to official duties. In face of the urgency of accelerating advanced capacity building public salaries should be adjusted step by step to prevent the most intelligent from leaving government service.

Up to now the need for middle level technicians and engineers has been entirely neglected because the Bachelors of the FWRI are in the majority under-employed and willing to do any kind of work near the city.

1.3 Problems related to the technical research environment

Assessment of the current capacity must not be limited to the people alone but should comprise an assessment of the technical environment in which research is expected to take place.

The most serious problem facing coordinated forestry research is the complete lack of a research infrastructure. The now 71 people allocated to the newly created FWRI are scattered throughout the DFW buildings. There is no coherent working unit identifiable as „the Research Institute“. FWRI shares rooms, library and fledgling collection of botanical samples with DFW. Laboratories for microscopic investigations, seed or soil investigation, weighing and drying of samples and other basic investigations do not exist.

There is no equipment available, such as freezer, microscopes, balances, drying oven, and moisture meters to carry out most basic research. Cameras, binoculars, compasses, distance tapes, height meters, Geo-Positioning devices (GPS), GIS equipment, notably plotters and digitizer boards, are only

available where international projects supplied them. Funds for repair and maintenance are insufficient. Normally, 4 to 10 people occupy one large office. These conditions must be urgently adapted to actual requirements if forestry research capabilities shall be developed.

1.4 Need for upgrading technologies

In principle, modern technologies and equipment should be used in Cambodia for accelerating research activities and for production of data for a forestry database. However, it will be indispensable to fund not only the purchase of equipment but to consider also financial support for trainers and for training FWRI staff in the application of these new tools.

One of the priority research tasks concerns development of adequate plantation and rehabilitation techniques. In order to know site quality and soil properties, soil analyses will be necessary. For the initial 3 years of operation of FWRI the use of "Soil Analytical Kits may produce rapid results. Their use would not require experience with different soil chemical analyses. In the field of seed procurement from natural source the DANIDA funded Seed Tree Project is introducing modern methods and equipment for seed treatment and storage as well as training in the use of the related installations. Equally important will be the establishment with upgraded technology of a wood anatomy laboratory, of a laboratory for investigation of physical properties of Cambodian tree species and for wood preservation. Here as in any other fields of research applying new technology, successful and productive use would depend largely on the adequate qualification of staff in the use and maintenance of the equipment.

Finally, so far only the lack of qualification of scientific staff has been dealt with. However, any research institution depends to a large extent on the availability of technical staff, laboratory assistants and technicians. This level of professional qualification is not available in Cambodia. The technical support staff needed for experiments in the field and the laboratory, set-up of testing and recording instruments etc. will have to be trained in the neighboring countries. So far, no estimate has been made of the number of technical staff required for running the FWRI. This ITTO Project proposes to send 10 staff to Malaysia for training as lab assistants.

2. Analysis and Interpretation of Information

Comments made by DFW, by foreign experts, the Cambodian Timber Industry Association and representatives of DFW and the Faculty of Forestry confirm the assessment made already in the Pre-Project document, i.e., "that forest research and technology capability in Cambodia is far from satisfactory and the ability to analyze the environmental, economic and social implications of various resources management options is limited".

The staffs of FWRI are presently not yet fully qualified to develop adequate forest management regimes and to evaluate their efficacy on their own. Also, as a consequence of the civil war, senior staff that could function as team leaders of small-scale research activities is not available.

Also the Faculty of Forestry Science is still not fully equipped and suffers from the same imperfect infrastructure conditions found in most government institutions. Consequently, there has been little improvement in the qualification of graduates. It is not yet foreseeable when the Faculty will dispose of the human and technical resources to graduate Master level candidates. At this time, potential candidates would have to study in one of the neighboring countries.

The major deficits of graduates are a lack of a solid scientific background in natural sciences, mathematics, physics, biology, chemistry, mathematical statistics, ecology, etc. All staff needs training in English writing and reading to gain easier access to and the ability of writing scientific publications. Equally, forestry terminology must be taught and an English-Khmer scientific dictionary compiled. The following table summarizes data and describes the potential of 65 junior staff members, bachelors, engineers and technicians allocated to FWRI

2.1 Current Research Capacities

As can be seen from table 3, about 39% of DFW staffs hold a Bachelor degree or higher, 30% are middle level, engineers or agents, while another 30% are unskilled labors. In principle there should be enough potential for operating a forestry research institute. However, Because of the constraints

resulting from poor education, lack of technical and financial research resources the current research capacity does not suffice to engage in medium to long-term research activities.

Table 3: Number and qualifications of staff of DFW

Number of persons employed by DFW and their level of education		
(a) Quantity of experts with Ph.D degree	Ph.D	3
(b) Quantity of experts with post-graduation degrees	Masters	15
(c) Quantity of experts with graduation degrees	Bachelors	279
(d) Quantity of middle level technicians	Technician	137
(e) Basic level technician	Agent	96
(f) Skilled labor	Worker	8
(g) Unskilled labor		227
Total number of personnel in forestry-related fields		765

Table 4 provided an overview of Ph.D and Master degrees obtained during the last five years in different countries. However, the work condition in DFW are difficult that of the 37 master degrees holders, only 15 are working for DFW, while 22 have taken employment elsewhere. It is not known how many work in other government agencies and how many are working in the private sector.

Table 4: Human Resources Development for the period 1996 to 2001

Year	1996		1997		1998		1999		2000		2001		Total
Country	MA	PhD	MA	PhD	MA	PhD	MA	PhD	MA	PhD	MA	PhD	
USA	-	-	-	-	2	-	-	-	-	-	-	-	2
Thailand	3	-	-	-	1	-	-	-	1	-	-	-	5
Japan	-	-	1	-	-	-	1	1	-	-	-	-	3
Czech	-	-	-	-	-	-	1	-	-	-	-	-	1
Germany	-	-	-	-	2	-	-	-	-	-	2	-	4
Malaysia	-	-	-	-	-	-	3	-	-	-	2	-	5
England	-	-	-	-	-	-	1	-	1	-	-	-	2
Cambodia	-	-	-	-	-	-	-	-	9	-	7	-	16
Total	3	-	1	-	5	-	6	1	11	-	11	-	38

In addition to long term training staff also took part in short-term instruction outside of Cambodia. In the period 1980 to 1999 on average 10 people per year received training in countries of the former Eastern block. From 1999 on short term training increase considerably with an average of 39 staff per year under going upgrading their professional knowledge. Over 80% of training took place outside of Cambodia (see table 5). The value of such short education should not be under estimated, because in most cases training is specifically oriented to need arisen during practical work in the forest or nursery.

2.2 Upgrading of technologies

International donors supply funds to secure attendance of DFW staff of international conferences and workshops. Such events are often coupled with technical visits to university or industrial research and production facilities. Staff of DFW is therefore aware of the technological advances made during the last 10 years in the fields of surveying and mapping (GIS and GPS applications), biochemistry, tissue culture, wood protection, etc. However, none of these technologies, e.g. cloning and accelerated propagation of planting stock is being used in Cambodia. This is not only due to a lack of bachelors and Masters of Forestry Science but the complete absence of laboratory and forestry engineers, laboratory technicians and skilled workers. With regard to the urgent need of beginning reforestation of 2.6 million ha of degraded land advanced technologies in nursery management are the only way of securing wood supplies for future generations. For promoting access and use of these new technologies a medium-term capacity building concept must be developed, particularly to enable Cambodian forestry scientist to judge which of these technologies are appropriate for application in Cambodia at a given point in time.

3. Results and Conclusions

Staff of the DFW-FWRI are eager to upgrade their knowledge in all fields of forestry science and beyond. At present such advances in education can only be obtained outside the country. The costs of master degree at Malaysian University amounts to US\$ 15,000 for a degree course of 2 years. These costs are beyond the reach of normal government staff (annual salary for a middle level officer is around US\$ 600). Therefore any outside assistance such as fellowships from project or NGOs or support offered by ITTO imply a significant input towards attaining the goal of sustainable management of natural resources.

Advances in applied forestry science do not necessarily depend on academic study. Even more important under Cambodian conditions is on-the-job training or learning-while-doing. Here, visiting foreign scientist could be a most value source of technology and know-how transfer.

Scientists of many biological disciplines have shown an interest in doing research and data collection in Cambodia. They can assist in training young graduates in doing field research.

Although being under two different ministries cooperation between the Forestry Faculty and the Forestry and Wildlife Department need to be intensified in mutual interest. Graduates are desperately looking for meaningful topics for their bachelor's thesis while DFW needs professional assistants for their field investigations.

There is a certain risk that capacity building is limited to the immediate needs of forestry and the forest industries. But the forestry sector is a part of the national economy and its social and cultural network of relationships. Therefore, interdisciplinary cooperation and research are essential for broadening the scope of research.

The overall situation of FWRI severely restricts the capability of its graduated staff for independent thinking and for developing practical solutions in face of the manifold management and planning needs in the daily work of DFW. Equipped with limited tools an unsuitably educated the potential of staff for conducting research and experiments must be considered as insufficient.

4. Recommendations

The most important recommendations are:

- to put human resources development on a broader basis, not necessarily limited to forestry but economic and social problems as well,
- to promote academic training but to attach equal importance to on-the-job training by visiting scientists,
- to realize that most of the forest management problems of Cambodia demand "hands-on-foresters" and to a lesser degree fundamental research,
- to institutionalize close cooperation between Department of Forestry and Wildlife and the Faculty of Forestry Science,
- to demand that candidates having received training abroad are willing to function as trainers;
- to transfer technical and professional advances to the provincial forestry offices,
- to seek a fair balance in forest management and forest utilization between administrative and legal issues on one hand and the social, cultural and economic needs of the 80% of rural dwellers and forest dependent communities on the other,
- to practice more cooperation and resources sharing between projects of international technical assistance and to encourage DFW to promote such synchronization whenever feasible.

IV- Annex

Table 5: Short-term training for the period 1980 to 2001

Year	Training	
	External	Internal
1980	65	-
1981	4	-
1982	2	-
1983	-	-
1984	-	-
1985	12	-
1986	-	-
1987	10	-
1988	8	-
1989	3	-
1990	2	-
1991	15	-
1992	15	-
1993	19	-
1994	13	-
1995	33	-
1996	88	-
1997	52	11
1998	64	12
1999	84	-
2000	94	104
2001	43	-
Total	626	127

(Source: DFW-Administration and Personnel Office)

V- Bibliography

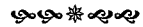
- ARD: Forest Policy Transition Paper for Cambodia (Techn. Version). For.Pol.Ref. Proj., Phnom Penh, 1998
- AZMAN, Hassan: Technical Training and Human Resource Development. The Peninsular Malaysia Experience. Tech. Pap. Workshop on HRD for Improvement of Forest Industry In Cambodia, Phnom Penh, 2000
- BRUENIG, E.F. and J. POKER: Management of Tropical Rainforests. Proceed. Int. Symposium Jan.1989. DSE, (German Foundation for International Development), Feldafing, Germany, 1998
- CARLE, J.: Reforestation and Natural Forest Rehabilitation Policy in Cambodia. Tech Pap.no.3, Policy Reform Project, DFW - ARD, Phnom Penh, 1998
- CIA: Country Profile Cambodia, Washington D.C., Central Intelligence Agency, 2000
- DFW-ITTO: Technical Report, 2001 Development, Phnom Penh, Ministry of Planning, 1999
- DFW-ITTO: Forest Industries in Cambodia: Training of Forest Practitioners Phnom Penh,
- FAO: The Participatory Process for Supporting Collaborative Management of Natural Resources. Prepared by Ingles, A.W., Musch, A. Qwist-Hoffmann, H. Rome, 1999
- FAO 1957: Les méthodes de plantations forestières en Asie tropicale. Mise en valeur des forêts. Cahier no.11. Rome, Italy 1957
- FAO-FORSPA: Forestry Research Management. Tech. Document GCP/RAS/134/ASB. Proceed. Int. Seminar, Dehra Dun, India, 2-6 March 1993,1994
- FORSPA/FAO: Priorities and Institutional Arrangements for Forestry Research in Cambodia. Report of the National Seminar 7 May 1997, Phnom Penh, Cambodia, 1997
- FORSPA: Field Document No.6, FO:GCP/RAS/163/NET, Phnom Penh, 15 pp.
- FWRI: Draft "Forestry Research Strategic Plan 2000 – 2010", Phnom Penh, Forestry and Wildlife Research Institute
- GTZ: Forest Cover Monitoring Project", Eschborn-Germany, Technical Cooperation Germany Final Report (in German), 1999
- ITTO 1998: ITTO Libreville Action Plan 1998-2001. International Timber Trade Organization, Pol. Dev. Series no.8, ITTO, Yokohama, 1998
- MACANDREWS, C: Strengthening Institutions for Implementation of Forest Policy in Cambodia. For. Policy Reform Project, DFW-ARD, Tech. Pap. No. 7; Phnom, 1998 Leap Agricultural College Development Plan, Phnom Penh, Min. of Agriculture Phnom Penh 1995
- MoEYS: Education Indicators 1997-98, Phnom Penh, Ministry of Education, Youth and Sport Phnom Penh, 2000
- MoP: Cambodia Human Development Report 1999. Village Economy and Development Phnom Penh 2000
- MRC/GTZ: Assessment and Monitoring of the Lower Mekong Basin Forest Cover, Vientiane 2000.
- RGC-MAFF-DFW: Project Proposal for the Establishment of a Forestry Research and Training Center, DFW, Phnom Penh, 1999
- SEAMEO: Educational System in Cambodia. Manila, South East Asian Ministers of Education

- SIN MENG, S: Forestry at the Institute of Agricultural Technique, Curriculum Dev., Cambodia. UNDP, TOKTEN, Phnom Penh 1993
- TENNENT, R.B. 1998: Development of a Forestry Research Policy in Cambodia. Forest Policy
- TENNENT, R.B. 1998: Report on Growth and Yield Studies Consultancy in Cambodia.
- TOSHIYASU, K. KAPLAN, J.A., CHAN S. and REAL, S: Cambodia: Enhancing Governance for UNCTAD: International Tropical Timber Agreement .New York and Geneva, UN Publ. No.GE.84-53108, 1994
- WB-UNDP-FAO 1996: Forest Policy Assessment Cambodia. Mission Report, W.B. Magrath, mission leader. Phnom Penh, 60 pp., 1 map
- WCSFD: Our Forests – Our Future. A. Krishnaswamy and A. Hanson, ed's), WCSFD, Winnipeg, Manitoba, Canada, Summary Report, 1999

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- BREU, Thomas, Chief Technical Adviser, Watershed Classification Project, MRCS personal communication, Phnom Penh, 2000/01
- CHAN SOPHAL Deputy Director, Forest and Wildlife Research Institute
- CHORNG TOL, Staff of Forest Management Office
- EANG SAVET, Deputy Chief, Forest Management Office
- FELDKOETTER, Christoph, GIS Consultant, personal communication, Phnom Penh, 2000
- HESS, Juergen Dr., Cambodian-German Forestry Project, personal communication,
- HUN EANG, Chief of BAEK CHAN nursery
- LIM SOPHEAP, Secretary of Forest and Wildlife Research Institute
- MEN PHIMEAN Chief, Wildlife Protection Office
- NOURN THEANEA, Chief of Forest Engineering Office
- OUK SYPHAN, Deputy Director, Department of Forestry and Wildlife
- SO, Than, Head, Provincial Forestry Office Kampong Thom, personal communication, 2001
- THONG SARATH, Deputy Chief Accounting and Planning Office
- TY SOKHUN, Director General, Department of Forestry and Wildlife
- UNG SAM ATH, Deputy Director, Department of Forestry and Wildlife
- VANPRAET, Ch. Cambodian-German Forestry Project, personal communication
- VON, Monin, Dean, Faculty of Forestry Science, personal communication Phnom Penh, 2000/01
- VONG, Sarun, Director, FWRI, personal communication, Phnom Penh, 2001
- YOSHIDA, K.: JICA representative at DFW, personal communication Phnom Penh 2001.

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