

## 2. Research Activities (Apr.2002-Mar.2003)

### 2.1 Outline of Activities

#### (1) Center

Arid Land Research Center (ALRC) is an independent department of Tottori University and at the same time is a National Joint-use Research Institute of the Ministry of Education, Culture, Sports, Science and Technology. The mission of the ALRC is to conduct research on desertification and to develop sustainable agricultural practices in arid and semi-arid areas. The door is open to all teachers of national universities who are engaged in this field of study.

ALRC was designated as a candidate to be qualified as a 21<sup>st</sup> Century COE program (Program for Arid Land Science). The aim of this program is to construct the new arid land science that is unparalleled worldwide. The ALRC etc. (including the predecessor), have accumulated knowledge and technology of plant production and vegetation recovery in sands over the past 80 years. We are advancing this knowledge and technology to those that are used easily for the arid lands on the world. To achieve our goal, we fuse knowledge and technology of public health and energy engineering. The mission of this program is to contribute towards environmental sustainability through development of technical package that will be easily adopted by arid land inhabitants. Achievement of this objective forms the foundation of designing our national arid land science as a worldwide top-level program in this field. Consequently this will contribute to increasingly technological support of Japan as a UNCCD ratification country.

In 2001, we started for the Core University Program (by JSPS) focusing on combating desertification and developmental utilization in inner area of China between Arid Land Research Center, Tottori University and Water and Soil Conservation Research Institute, CAS in China.

#### Organization, Management, and Funding Subsidies

ALRC is managed by the Director, a Conference composed of professors and associate professors, a Board of Management composed of members from outside as well as professors of ALRC, the five research divisions, two office sections (the international research cooperation section and the joint-use section) and the technical section. In practice the Conference and the Board of Management operate our Center.

The five divisions are:

- 1) Arid Land Environment: Natural Environment, Water Resources
- 2) Biological Production: Plant Ecophysiology, Plant Production
- 3) Afforestation and Land Conservation: Revegetation and Grassland Development, Land Conservation
- 4) Comprehensive Measures to Combat Desertification
- 5) Arid Land Sciences (Visiting)

The three full-time divisions from 1) to 3) each have two professors and two associate professors. The full-time division of 4) has one professor. The Visiting division has two visiting professors and one associate professor from Japan and, three visiting professors from abroad. In addition, three Post-Doc researchers and COE researcher (Nov. 1, 2002 -) are stationed at ALRC. Nine office staff (four clerks and five associate clerks), four technical officers and two research support technicians support the research and education.

With regard to the funding, subsidies for scientific study in the fiscal year of 2002, a total of five themes were adopted:

Scientific Research (B)	: 2,
Grant-in-Aid for Young Scientists (B)	: 1,
Encouragement of Scientists	: 1,

With regard to other research funding, a total eleven themes were accepted:

Scholarship Contribution	: 8,
Entrusted Research	: 2,
Joint Researches with private enterprises	: 3,

### **Joint-Use Research, Education, Publication**

During the fiscal year of 2002, 52 Joint-Use Researchers (Teachers from national and private universities) were attached to the Center. The number of students as of April 2003 is 66 (14 Ph.D. Students, 35 Master Students, 13 Undergraduate Students, 2 Trainees and 2 Foreign Research Students).

Seminars were often held by a large number of internal and external experts. The foreign visiting professors periodically give seminars.

Annual report has been published since the establishment of ALRC, which provides a brief overview of the activities in its various divisions and also summarizes our research and education.

The 12th seminar of Joint Research was held on December 3, 2002 at Arid Land Research Center, Tottori University. Nineteen poster presentations were performed.

'Japan-China Joint Seminar on Combating Desertification and Developmental Utilization in Inner China' was held on November 15 and 16, 2002 at Institute of Soil and Water Conservation, CAS in China. The planning to combat desertification and developmental utilization was discussed.

## **(2) Divisions**

### **1) Division of Arid Land Environment**

#### **Subdivision of Natural Environment**

Subdivision of Natural Environment conducts research on evaluation of the natural environment and the exploitation of natural resources and energy for the development of arid and semi-arid areas from the point-of-view of meteorology and climatology.

The staff in the subdivision consists of Dr. Kamichika M. (Professor), Dr. Kimura, R. (Assistant Professor), and Ms. Yonehara, A. (Associate Clerk, also assigned for the Subdivision of Water Resources). There were one Doctoral student, four master's students and four undergraduate students in the fiscal year of 2002. Ms. Matsuki and Ms. Yano are now seeking employment. Ms. Takagi entered the master's course of Tottori University.

In the fiscal year of 2002, the following researches have been conducted in Japan.

(1) MICROCLIMATE: Heat, water and CO<sub>2</sub> balance were observed in the upland rice field in Arid Land Research Center. Dr. Tang, C. (Graduate School of Science and Technology, Chiba University), Dr. Ooba, K. and Dr. Nakamoto, K. (National Agricultural Research Center for Kyushu Okinawa Region) have conducted the joint research of this subdivision 'Researches on modification of microclimate of agricultural fields in arid lands'. Dr. Kimura continued the research of "Studies on the heat balance in the subtropical plant fields" by Monbusho Grant-in-Aid for Scientific Research from April 2001 to March 2003, and obtained the knowledge as to a heat balance.

(2) REMOTE SENSING: Under theme 'Analysis of Arid Land Surface Conditions by Remote Sensing' for joint research, cooperative works have been still continued with Dr. Ishiguro, E. (Faculty of Agriculture, Kagoshima University), Dr. Matsuoka, N. (Faculty of Horticulture, Chiba University) and Dr. Moriyama, M. (Faculty of Engineering, Nagasaki University). 2002 was the second year that we started for the Core University Program between ALRC and the Institute of Soil and Water Conservation, Chinese Academy of Sciences, so we started the analysis of satellite data for the purpose of combating desertification in the Loess Plateau, China. We, including Dr. Takayama, N. (researcher, ALRC) began to make field

observations.

(3) WIND EROSION: Relationship between the wind climate and sand movement have been investigated by measuring sand movement every month in the Tottori Sand Dune and observing the wind speed and direction which have been measured automatically in a sand dune. Dr. Kawamura, T. (Graduate School of Humanities and Sciences, Ochanomizu University) cooperated in this study.

(4) MEASUREMENT OF NATURAL ENERGY: The electric power by solar radiation and wind have been studied as a cooperative study with Dr. Hayashi, T. (Faculty of Engineering, Tottori University). Study on the recycling use of agricultural water resources was conducted using the method of distillation.

Overseas research in the fiscal year of 2002 was as follows: Dr. Kamichika, Dr. Kimura and other members started the field observations in the Ryudougou basin located in Shenmu district, Shanxi Province, China for Japan-China Joint Project from June 10 to 23, 2002 and from Aug. 12 to 21, 2002.

(1) The spectral reflectance of typical land covers was studied in Liudaogou basin and the surrounded area in order to make the land cover map of Shenmu country from satellite images. The spectral reflectance of each land cover were unique, so it is possible to make the land cover map by using the satellite images.

(2) A three layer soil model was presented for making clear a heat and water balance and the potential production of vegetation from the point of view of soil water content in the Loess Plateau. The model was applied to the actual bare soil fields in the Tottori sand dune and the Loess Plateau. The calculated results for the soil temperature, soil water content and heat balance components agreed well with observed values. The calculated error of the daily evaporation was  $0.03\text{mmday}^{-1}$ . This indicates the applicability of the model in a semi-arid region having little evaporation.

(3) The prediction method of rainfall in the Loess Plateau was indicated by using the thermal infrared data of a GMS5. Relationship between the digital count value and the rainfall was good. However, it was necessary to add visible data as another parameter in order to raise accuracy.

### Subdivision of Water Resources

*Staff and students:* The staff consists of Dr. Yano, T. (Professor), Dr. Yasuda, H. (Associate Professor) and Ms. Yonehara, A. (Associate Secretary, also assigned for the Subdivision of Natural Environment), two Doctoral, four Master's, and 1 undergraduate students (4th grade). Dr. Yasuda was transferred from Tsukuba University on June 16, 2002.

Mr. Yang, S.H. received the doctor's degree of agriculture and finished the course in March 2003. The title of dissertation is "Effects of saline water irrigation on evapotranspiration from citrus". Ms. Hashizume, H., second year student of the Master's Course (MS), completed the course and is now seeking employment. Mr. Yamamoto, T. of undergraduate student (4th grade) has been still temporarily absent from school for an economical reason.

*Research:* Research has been conducted in Japan and abroad on efficient water and soil management for water saving irrigation and saline water irrigation from the view point of protecting lands from desertification and for the sustainable agricultural utilization of arid lands.

Studies in Japan: Our efforts in Japan have been made to carry out research themes on water and soil management for water saving irrigation and saline water irrigation based on a simulation approach as well as an experimental approach. Research on the measurement of stem flow through herbaceous plants and arboreal plants was also conducted to establish the measurement technology for the stem heat balance method and the heat pulse method. Furthermore we conducted researches on water management method for reuse of drainage water in agricultural lands equipped with subsurface drainage system under arid and semi-arid climate.

Overseas Research: A research on 'Effect of global warming on crop productivity' has been conducted related to a research project on 'Impacts of climate change on agricultural production in arid areas' of the Research Institute for Humanity and Nature of Ministry of Education, Culture, Sports, Science, and Technology. This research project has been conducted mainly in a semi-arid area with the Mediterranean

Sea climate in the Republic of Turkey. In line with this research, Dr. Yano visited Turkey in August to conduct micro-meteorological observation and evapotranspiration measurement over a soybeans field near Adana and to conduct a field survey on salt accumulation in an irrigated area near Izmir.

Cooperative researches have been conducted with the following researchers: Prof. Nishiyama, S. (Faculty of Agriculture, Yamaguchi University), Prof. Chikushi, J. (Biotron Institute, Kyushu University), Prof. Shimada, Y. (Graduate School of Letters, Nagoya University), Dr. Odani, H. (School of Environmental Science, University of Shiga Prefecture), Dr. Watanabe, T. (Research Institute for Humanity and Nature), Dr. Takeuchi, S. (Faculty of Engineering, Kyushu Kyoritsu University) and Dr. Aoda, T. (Faculty of Agriculture, Niigata University). One new research project was started with Prof. Tsujii, H. (Graduate School of Agricultural Science, Kyoto University). The titles for these research projects are listed in the joint research section of this Annual Report.

## 2) Division of Biological Production

### Subdivision of Plant Ecophysiology

*Staff:* The staff consisted of Dr. Inanaga, S. (Professor), Dr. Sugimoto, Y. (Associate Professor) and Ms. Fukunaga, M. (Associate Clerk, also assigned to the Subdivision of Plant Production).

*Studies in Japan:* The main research work of the division is on eco-physiological studies of plant growth and yield responses to salinity and drought stress, biochemical and molecular-biological studies on plant salt stress and control of parasitic weeds of semi-arid areas. Joint researches have been conducted with several researchers (Drs. J. Abe of Univ. of Tokyo, E. Tanimoto of Nagoya City Univ., H. Shimizu of National Institute for Environmental Studies, P. An of National Institute for Environmental Studies, T. Kobata of Shimane Univ., T. Takahashi of Yamaguchi Univ.) on the root system development under arid conditions. In other joint research activities, studies on sustenance of oasis ecology were conducted with Dr. Qiman (Visiting Associate Professor of Xinjiang Agriculture University) and Dr. T. Matsui (with Funding from Mitsubishi Heavy Industries, LTD). In addition, Dr. Inanaga assumed leadership of the 21st Century COE Program (Sub-title: Arid Land Science Program) launched in 2002 by The Ministry of Education, Culture, Sports, Science and Technology. Dr. Inanaga was also appointed the Japanese Coordinator of the JSPS Core University Program, focusing on combating desertification and enhancement of rural development inland China. Fourteen research papers were published during the year.

*Studies abroad:* Drs. Inanaga and Sugimoto visited the Chinese Academy of Sciences and the Institute of Soil and Water Conservation (CAS) under the auspices of the JSPS Core University Program. In addition, Dr. Inanaga attended a UNESCO-MAB/ICARDA (The International Center for Agricultural Research in the Dry Area) joint workshop organized by ICARDA and had meetings on Joint Research and Education Program with KACST of Saudi Arabia and ARC of Sudan. Dr. Inanaga was appointed member, Board of Trustee of ICARDA on the recommendation of The Ministry of Foreign Affairs of Japan. Also, Dr. Sugimoto conducted research on the eco-physiology of parasitic weeds as a visiting researcher financed by The Ministry of Education, Culture, Sports, Science and Technology at The University of Sheffield for 10 months, up to January 2003.

*Students:* There were six Ph.D. students [one in 3rd grade – T. Inoue, five in 1st grade – W. Tsuji, T. Hattori, N. Yasuda, Bulli, P.A.M. (government-financed foreign student from Sudan) and Li Xiangjun (government-financed foreign student from China)]. There were five M.Sc. students (one in 2nd grade – M. Murakami and four in 1st grade- K. Ikeda, M. Ito, K. Sonobe and Y. Hiraoka) and four undergraduate students (two in 4th grade – T. Hatanaka and K. Fujita and two 3rd in grade – Y. Asamitsu and M. Watanabe). We also had one research student (Gama, P.B.S.), a government-financed foreign student from Sudan.

One of the M.Sc. students (M. Murakami) was employed at JICA (Japan International Corporation

Agency); an undergraduate student (T. Hatanaka) is continuing his studies at the M.Sc. level and another student (K. Fujita) was employed by a private sector company.

*Additional assignments:* Dr. Inanaga was a councilor of the Japanese Society of Sand Dune Research and the Japanese Association for Arid Land Studies. He was also appointed as a member of Desertification Division under the committee for planning research projects on global environmental issues by The Ministry of the Environment. Dr. Inanaga was also an expert of the Committee of Policy on Food, Agriculture and Rural Community of The Ministry of Agriculture, Forestry and Fisheries of Japan; a member of the JICA advisory committee for the Middle East; the president of the committee to activate Tottori Sand Dune and a member of the executive committee on the New Discovery of Tottori Sand Dune. Dr. Sugimoto was a councilor of the Japan Society for Bioscience, Biotechnology and Agrochemistry, Chu-shikoku branch. In addition, Dr. Inanaga was invited to The Imperial Palace and gave a lecture on agriculture and desertification in arid land.

### **Subdivision of Plant Production**

The subdivision is composed of Dr. Kunio Hamamura (Professor), Dr. Masao Toyama (Associate Professor), Ms. Mitsue Fukunaga (Associate Clerk), 1 doctoral course student, Mr. Gamaan R. Shamas from Oman (until September), 3 students in the master course, Mr. Wenjun Han from China, Ms. Yoko Ogino and Ms. Ritsuko Sasaki, 1 senior student (Undergraduate), Ms. Yuko Shudo, and 1 research student, Mr. Daisaku Morita.

The research includes broad spectrum of problems concerning the utilization of plant resources in dry areas. The focuses were put on crop production problems pertaining to arid and semi-arid lands, and an additional attention is put on Xerophyte and Halophyte studies. Crop production systems under dry conditions were studied with emphasis put on crop tolerance against water deficiency and salinity. The major subjects studied were the ecology of drought and salt tolerant plants in arid areas, effects of saline water irrigation on vegetable production, effects of salt on a halophyte, *Salicornia bigelovii*, the root nodule formation of pigeon pea under different fertilization, effects of various mineral elements on *Brassica campestris*, and effects of water holding substances and soil amending materials.

Dr. Hamamura visited China 2 times under exchange program between the North-west Sci. and Tech. University of Agriculture and Forestry, China, and Tottori University to study on combating desertification in Inland China. Dr. Toyama undertook several field experiments in China and Mongol on the use of water holding substances in desert areas. Special emphasis was laid on the effect of these substances on desert afforestation and on water saving cultivation.

## **3) Division of Afforestation and Land Conservation**

### **Subdivision of Revegetation and Grassland Development**

The present staff of this subdivision consists of Dr. Tamai, S. (Professor), Dr. Yamanaka, N. (Associate professor), Mrs. Hamamoto, N. (Associate Clerk, also assigned for the Subdivision of Land Conservation), 1 Doctor's, 6 Master's, and 2 undergraduate students. Our research focuses on afforestation in semi-arid areas, especially on the plant communities and their specific characteristics. The research mainly includes: (1) the distribution of plants in semi-arid land and its specific characteristics, (2) the maintenance mechanisms of plant communities in arid areas, (3) the relationships between water and nutrient dynamics, and the growth of trees, (4) the dynamics of plants on sand dunes, (5) the salt tolerance of woody plants.

The most important research in this subdivision is the prevention of desertification and afforestation in semi-arid areas by native plants and we are analyzing vegetation of China mainly.

Studies on the revegetation and natural vegetation are in progress in Turkey and China. In September, Dr. Tamai visited Turkey to conduct field survey on forest vegetation, which is related to research project on

'Impact of climate change on agricultural production in arid areas' of the Research Institute for Humanity and Nature.

Dr. Yamanaka visited Xaanxi Province of China in May, July, October and November and researched on the revegetation of Loess Plateau.

While the distribution and growth of trees in semi-arid areas mainly depend upon water conditions of the soil, nutrients connected with water also play an important role on the growth of trees. Then research on water and the nutrients dynamics of trees and in the soil with the growth of trees has been conducted. This investigation aims to clear the dynamics of nutrients in the soil with changing soil water potential using six large scale lysimeters in vinyl houses.

Salinity of the soil in semi-arid land sometimes becomes a hazard for the germination, establishment and growth of trees. Studies on the ecology and ecophysiology of salt tolerant trees are in progress. In 2001, Salinity effects on the growth of *Populus alba*, *Tamarix chinensis*, and Mangrove trees were mainly investigated.

Studies on afforestation of hardwood in pine forests damaged by pine wilt disease on coastal sand dunes, are also in progress. Ecological researches of plants on sand dunes and studies on growth and reproductive characteristics of woody plants in arid areas have also been conducted.

Cooperative research on the drought stress tolerance of trees was conducted with the scientists for joint research of the Center. And a number of trainees from abroad were taken on.

### **Subdivision of Land Conservation**

The main studies in this subdivision were on the dynamic movement of moisture and salt in the soil under arid land conditions and on the mechanism of soil water erosion and collapse of aggregate structure were also studied in order to promote research on the mechanism and control of desertification. The staff is made up of Dr. Yamamoto, T. (Professor), Dr. Inoue, M. (Associate Professor), Mrs. Hamamoto, N. (Associate Clerk assigned to the entire Division) and nine students. Three students are enrolled in the doctoral course at the United Graduate School of Agricultural Sciences, five as master course students and three as undergraduate students in the Faculty of Agriculture.

The main domestic research titles are (1) Studies on solute dynamic transport during salt accumulation and leaching, and determination of effective soil management method in arid land supported by Monbukagakusho Grant-in-Aid for Scientific Research B(2), (2) Studies on evaluation and standardization of the soil hydraulic and solute transport properties in situ supported by Monbukagakusho Grant-in-Aid for Scientific Research B(1), (3) Effect of water pollution on clogging of emitters and filters of micro-irrigation system supported by Ministry of Agriculture, Forestry and Fisheries since 1992, (4) Prevention of water erosion from revegetation bed soil under sedums cultivation in green roof supported by Nishimatsu Construction Co., Ltd., (5) Finally, concerning with '21<sup>st</sup> COE Program for Arid Land Science', studies of environmental monitoring and environmental restoration technology were aggressively begun by using facilities of the three dimensional soil water erosion analyzing system, monitoring system for water flow and solute transport and desertification mechanism analysis system introduced in Arid Land Dome.

As joint research with other divisions in universities, the staff carried out (1) Studies on farm land conservation in arid land, with, Dr. Nishimura, T. (Tokyo Univ. of Agric. and Tec.), Dr. Roy, K. (Nihon Univ.) and Dr. Tanigawa, T. (Osaka Prefecture Univ.), (2) Studies on analysis of surface conditions in arid land by remote sensing, together with Dr. Torii S. (Kyoto Univ.), (3) Studies on salt accumulation and leaching using the monitoring system for water flow and solute transport, together with Dr. Kihara, Y. (Shimane Univ.), Dr. Kasubuchi, T. (Niigata Univ.), and Dr. Yamanaka, T. (Tsukuba Univ.). (4) Free subject on arid land studies, together with Dr. Fukada, M. (Yamaguchi Univ.), Dr. Hara, R. (Daitobunka Univ.), Dr. Cho, H. (Saga Univ.), Dr. Takeshita, U. (Okayama Univ.), Dr. Ishikawa, Y. (Akita Prefecture Univ.), Dr. Kamiya, K. (Gifu Univ.), Dr. Fujimaki, H. (Tsukuba Univ.), Dr. Kosugi, K. (Kyoto

Univ.) and Dr. Yamada, T. (Tottori Univ.).

Dr. Yamamoto attended the Joint International Conference of the 2002 American Society Agricultural Engineering (ASAE) and International Commission of Agricultural Engineering (CIGR), held in Chicago USA during July 27 to Aug. 3rd. and presented the research titled 'Use of Photogrammetry in Monitoring Soil Erosion'. Also, Yamamoto visited and collected valuable information for advanced agricultural technologies from Chicago countryside through study tour, where had been developed as corn belts in USA.

Dr. Inoue visited the Soil and Water Conservation Institute of the Chinese Academy of Sciences on 13-18 May, 23-31 Aug., 14-17 Nov. 2002 and 24-27 Jan. 2003, based on the Core University Program of 'Studies on combating desertification and development in the inland region of China'. As a result of discussions, the research plan was fixed to measure the soil temperature and soil moisture distribution in order to clear up the relationship between soil degradation and crop yield reduction by repeated vegetable cultivations in plastic greenhouse in winter season. He accepted engagement of two open seminar lectures on 'Water Saving Strategies under an Irrigation System in Arid and Semi-arid Regions' in the forum on afforestation in arid land on 2 July, 2002, and on 'Development of economical and sustainable agricultural technology in arid and semi-arid areas' in Science Academy of Center for Joint Research and Development on 27 July 2002. The joint research projects supported by Monbukagakusho Grant-inAid for Scientific Research B (1) & B (2) were conducted from 2001. He organized the project session of 'Evaluation of soil hydraulic properties in situ' on the annual meeting of JSIDRE on 7 Aug. 2002. Two collaborative research projects on 'Establishment of optimum green technology on the roof and wall of buildings for plant growth and heat prevention' supported by a nonpublic corporation, and on 'Development of repeated technology in red Japanese potatoes cultivation in stead of covering additional coarse sand on sandy field' supported by Tokushima prefecture were presented in the fourth business-academia collaboration of the center for joint research and development, on 13 Dec. 2002. He attended the workshop on 'Practice of Soil Moisture Monitoring in Diverse Regions' on 17 Feb. 2003 and 'Temporal and spacing observation of soil moisture vertical distribution in vados zone of sand dune area' was presented.

### **(3) Division of Arid Land Science**

#### **Foreign Visiting Researchers**

The 18<sup>th</sup> foreign visiting professor, Dr. Berliner, Pedro Reuven (Wyler Dept. of Dryland Agriculture, Jacob Blausten Institute for Desert Research, Ben-Gurion University of the Negev, Israel), arrived on October 1, 2001 and stayed for one year until September 20, 2002. He conducted his study on 'effect of water quality, irrigation frequency and alternating water sources on the productivity and water efficiency of halophytes'. Besides his own research, he taught students with great zeal, and visited Research Institute for Humanity and Nature and gave his seminar. Furthermore, he gave seminars in ALRC. He visited Nagoya University and Kyoto University, and collected material on his study.

The 19<sup>th</sup> foreign visiting professor, Dr. Keren, Rami (Institute of Soil, Water and Environmental Sciences, Volcani Center, Agricultural Research Organization, Israel), arrived on October 16, 2001 and stayed for eleven months until August 31, 2002. He conducted his study on 'soil structure and soil hydraulic properties'. Besides his own research, he taught students with great zeal, and attended the 7<sup>th</sup> World Congress on Biosensors in Kyoto. Furthermore, he gave seminars in ALRC. He visited Kyushu University and Kyoto University and collected material on his study.

The 20<sup>th</sup> foreign visiting associate professor, Dr. Wen, Guang (University of Saskatchewan, Canada), arrived on April 1, 2002 and stayed for one year until March 31, 2003. He conducted his study on 'influence of application of sewage sludge and organic composts on plant N, Cu and Zn concentration'.

Besides his own research, he taught students with great zeal, and gave seminars in ALRC. Furthermore, he visited Sumitomo Chemical Co., Ltd., Okayama University and University of Tokyo and collected material on his study.

The 21<sup>st</sup> foreign visiting associate professor, Dr. Aydin, Mehmet (Mustafa Kemal University, Turkey), arrived on September 16, 2002 and stayed for one year until August 31, 2003. He conducted his study on 'Modeling of climate change impact on agricultural production'. Besides his own research, he taught students with great zeal, and attended a workshop at Research Institute for Humanity and Nature. Furthermore, he gave seminars in ALRC. He visited University of Tokyo, Ryukyu University, Kyushu University, Saga University and Nagasaki University and collected material on his study.

The 22<sup>nd</sup> foreign visiting associate professor, Dr. El Siddig, Kamal Ahmed Ali (Agricultural Research Corporation, Sudan), arrived on October 1, 2002 and stayed for one year until September 30, 2003. He conducted his study on 'Biochemical responses to salt and water stress in seedling of *Psidium guajava*, *Grewia tenax* and *Tamarindus indica*'. Besides his own research, he taught students with great zeal, and attended the Third World Water Forum in Kyoto. Furthermore, he gave seminars in ALRC. He visited Kobe University, Kyoto University, the United Nations University, Research Institute for Humanity and Nature and the Embassy of Sudan and collected material on his study.

### **Internal Researchers**

As internal visiting professors to ALRC, Professor Nakano, Yoshisuke (School of Agriculture, Kyushu University), Professor Miyazaki, Tsuyoshi (Graduate School of Agricultural and Life Sciences, The University of Tokyo) and Professor Morita, Shigenori (Graduate School of Agricultural and Life Sciences, The University of Tokyo) took their posts on April 1, 2001 and had conducted joint researches until March 31, 2003.

### **(4) Administration**

From April 9, 1998, Administration office changed to belong to Research Support Dept. of the Headquarters, Tottori University. And two sections, Research Cooperation Section and Joint-Use Section, were placed.

#### **Research Cooperation Section**

Research Cooperation Section is the administrative section that deals with the affairs related to the joint research of the ALRC.

There is one clerk (specialist: Mr. Watanabe, T.) in this section.

#### **Joint-Use Section**

Research Cooperation Section is the administrative section that deals with the general affairs for the management of the ALRC.

There are three clerks (Chief Clerk: Mr. Nagamura Y. and Clerks: Ms. Ohtsuka, Y. and Mr. Tanino, Y.) and five associate clerks (Mr. Tomemori, H. (Apr.1, 2002-Oct.31, 2002), Ms. Takahashi, K., Ms. Taketani, S. (Dec.1, 2002- ), Ms. Yonehara, A. <Division of Arid Land Environment>, Ms. Fukunaga, M. <Division of Biological Production> and Ms. Hamamoto, N. <Division of Afforestation and Land Conservation>) in this section.

#### **Technical Section**

The Technical Section is taking charge of the maintenance management of the experimental facilities and equipments and assistance on joint use of ALRC.

There are four technical officials (Mr. Ueyama, I., Mr. Shimizu, T., Ms. Kano, Y. and Ms. Hama, T.),



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two research support technicians (Mr. Takata, T. and Mr. Ohkatsu, K.) and a COE support technician (Mr. Kageyama, H. (Nov. 1, 2002 - ) in this section.