

PN-ACD-008
98402

*Vegetables for
Poverty Alleviation
and Healthy Diets*

A plan for 1998-2002



Asian Vegetable Research and Development Center

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The Asian Vegetable Research and Development Center is an international not-for-profit organization committed to ensuring the world's food security through research, development, and training

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AVRDC publication no 98-476

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Acknowledgment

This Center would like to thank the great many people from so many agencies, organizations and institutes who helped produce this five-year plan of action. It is the result of many months of consultation, including external surveys and in-house discussion. Truly, this plan is the shared product and property of AVRDC and its stakeholders: national agricultural research systems, non-governmental organizations, national and international research institutes, and the private sector. The Center would also like to thank Dr. Klaus Lampe, former member of AVRDC's Board of Directors, for his valuable comments and suggestions.

Acronyms

AVRDC - Asian Vegetable Research and Development Center

FAO - Food and Agricultural Organisation of the United Nations

IARC - International agricultural research center

IPM - Integrated pest management

NARS National agricultural research systems

NGO - Non-governmental organization

R&D - Research and development

WHO World Health Organisation of the United Nations

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Preamble

Five billion more people are expected on the planet within the next 50 years doubling today's population. More than half will live in urban centers and more than 80% will live in what is today called the developing world.

The challenges ahead for vegetable researchers are immense and complex but they can be met given sufficient resolve.

- Vegetable production must increase to remedy present inadequate availability and to keep pace with the world's rising population.
- Vegetable production increases must be achieved on less land, using less water, less supplemental plant nutrients, and less pesticides.
- A more diverse selection of vegetables must be made available to rural and urban poor in order to help ensure balanced diets and improved quality of life.
- More vegetable researchers must be trained to conduct applied and adaptive research in developing countries.
- Researchers must develop improved varieties and advanced production technologies adapted to diverse agroecological and socioeconomic conditions.

Recognizing that success in the coming years is crucial, the Asian Vegetable Research and Development Center (AVRDC) conducted a thorough evaluation to determine just what the Center can and should contribute in the next five years. Since everything that AVRDC does is in collaboration with partners, the Center consulted in a thorough and systematic way with research and development (R&D) professionals in the public and private sectors, nongovernmental organizations (NGOs), national and international research and extension organizations, and development agencies worldwide. The result is this plan of action for 1998-2002.

Staying the course

AVRDC is changing to meet a changing environment but the Center is guided today by the same beliefs that inspired its creation a quarter century ago

Our mission

To enhance the nutritional well-being and raise the incomes of poor people in the rural and urban areas of developing countries through improved methods of vegetable production marketing and distribution which take into account the need to preserve the quality of the environment

Our objective

To fulfill our mission through the development of improved plant germplasm and production technologies for the improvement of production systems in developing countries

Our strategy

To achieve the objective the Center as catalyst will collaborate with its partners to develop disseminate and facilitate the exchange of research methodologies improved germplasm technologies and know-how

Our values

- Firm adherence to a politically neutral position
- Creativity in our search for solutions to meet the needs of national agricultural research systems (NARS)
- Excellence in all of our undertakings
- Responsible use of resources mindful of future generations
- Gender consciousness recognizing the central role of women as vegetable growers processors and consumers
- Accountability to our donors and partners
- Respect for the local and informal knowledge of vegetable farmers
- Consumer orientation always striving for the production and marketing of more better and safer vegetables
- Modesty and sensitivity in our approach keeping in mind our limitations and our dependence on others to achieve our objectives

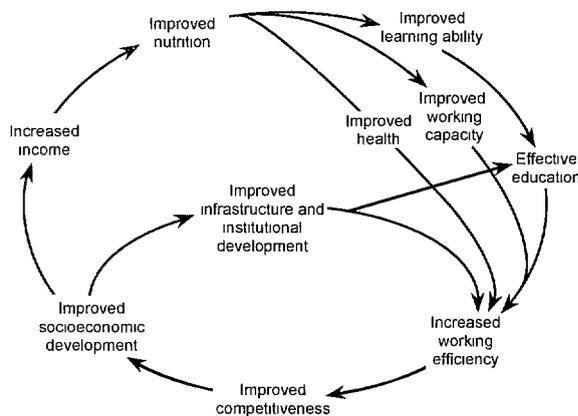
Vegetable production for nutrition & development

An estimated 2 billion people suffer from lack of vitamins and essential minerals. Most at risk are women and children living in developing countries. They are prone to ill health, suffer slowed physical and mental development, and are vulnerable to debilitating diseases, even blindness due to poor nutrition.

For developing societies, the consequences of micronutrient deficiency are severe – generations of school children unable to learn can grow up to be a nation's burden instead of its strength. The capacity for fruitful work is diminished, precisely where and when it is most needed. Thus, micronutrient deficiencies lock societies in a cycle of misery and underachievement.

Vegetables are the major source of most micronutrients and the only practical and sustainable way to ensure their supply. Vegetables are a critical, irreplaceable dietary component, not just a side dish to add flavor. Vegetables break the deficiency cycle and produce healthy populations able to work and learn.

The relationship between nutrition and socioeconomic development



But there is much more that links vegetables and socioeconomic development. The management skills needed to successfully produce vegetables are the very skills needed if economies are to develop. Growers learn about credit, contracts, quality, and marketing. In fact, a grower who masters commercial vegetable production, integrating four or five crops, probably has the management skills to run any related business.

Vegetable production is labor-intensive and earns high returns relative to other crops. Moreover, most of the work is done by women. Thus, vegetable production offers employment and higher incomes, especially to women. And families with disposable income are in a better position to send their children to school.

Fortunately, the importance of vegetables to health is becoming better known. In their definition of food security, the FAO and WHO advocate the need for balanced and safe diets. Calories alone are not enough. Vegetables are the critical ingredient to build healthy bodies and productive societies.

Opportunities in a changing world

Among the significant recent changes and opportunities that have shaped this five-year plan

Importance of micronutrients is understood

The importance of micronutrients – vitamins and essential mineral elements – is well established. The importance of a food-based approach to preventing micronutrient malnutrition, however, has only recently become widely recognized. Vegetables are in most cases the best answer to micronutrient deficiencies. Vegetables are also a major source of other bioactive compounds whose health-protecting properties are beginning to be understood.

Concern for the environment is heightened

There is a much-heightened and well-placed concern for the environment. Research institutes must take this into account with programs and technologies that are environment-friendly and cost-effective in their use of resources.

NARS are stronger

National agricultural research systems, especially in Asia, are gaining strength. AVRDC through collaboration has contributed to that strengthening. At the same time, interest in working together on vegetable research is growing. The Center sees its role as a promoter and facilitator to strengthen such efforts.

Technology has advanced

Agricultural researchers have more tools at their disposal, thanks to fairly recent advances in biological sciences. This is reflected in the Center's plan to use biotechnology tools extensively to speed and supplement conventional varietal improvement.

World trade is expanding

New export opportunities and new competition are changing traditional domestic markets. For instance, producers, processors, and marketers will have to adjust to rising demand for high quality fresh, canned, frozen, and dried vegetables, and ready-to-serve fast food products.

Donors are more discerning

Donor interest in agricultural research for improved nutrition has continued to grow for many years. But the need for accelerated research efforts, specifically for countries whose populations are growing fast, is not adequately reflected in national or international budget plans. Commitment to excellence and relevance are guiding our efforts to receive the support needed.

Choices

Where we work

Geographical regions – Asia will remain the Center's prime focus. That said, of all the continents, Africa has the highest population growth rates but the lowest production growth rates. AVRDC feels an obligation to make all efforts to bring about a sharing between Africa and Asia. Up to now, the Center has concentrated on Southern and Eastern Africa, but with new resources, AVRDC could link with agricultural research institutes in the region to serve West Africa where vegetables are a particularly important part of the daily diet. Unless sufficient resources are made available to the Center, no activities outside Asia and Africa within the next five years, beyond the ongoing special project for Central America, are anticipated.

Agroenvironments – We see our role, first and foremost, in the hot-wet and hot-dry environments in the lowland tropics. This shall indirectly reduce the stress on fragile tropical highlands and reduce post-harvest handling and transportation. AVRDC will fully utilize the diverse environments accessed from its headquarters in Taiwan and its research and training centers in Thailand (associated with Kasetsart University) and Tanzania. Combined, they provide all required agroenvironments: hot-wet, hot-dry, cool-wet, and cool-dry. They also represent diverse social environments in which to evaluate research outputs.

Hot wet	mean monthly maximum/minimum temperatures of >30/20°C and >200 mm monthly rainfall for 3-4 continuous months
Hot dry	mean monthly maximum/minimum temperatures of >30/20°C and <100 mm monthly rainfall for 3-4 continuous months
Cool wet	mean monthly maximum/minimum temperatures of <30/20°C and >200 mm monthly rainfall for 3-4 continuous months
Cool dry	mean monthly maximum/minimum temperatures of <30/20°C and <100 mm monthly rainfall for 3-4 continuous months

Our target production systems

AVRDC is meant to serve small and medium-sized household-run farms. We will concentrate on either of two vegetable production systems, depending on the importance of vegetables in an area, ecological limitations, marketing opportunities, and research opportunities.

- **Vegetables in cereal-based cropping systems**

Crop rotations that maintain soil fertility while serving the market will help ensure sustained income for current and potential vegetable growers and ensure supply of essential micronutrients. AVRDC's role is to balance economic and ecological interests by developing crop varieties and production methods that allow vegetables to fit various cereal-based cropping systems and which optimize nutrient production and pest management.

These systems are characterized by medium-sized farms using high quality seed, chemical fertilizers, irrigation, and output-oriented pest management strategies. With knowledge of integrated, high-input production systems based on environmentally sensitive and health-conscious use of agrochemicals, negative effects to the environment can be avoided.

- **Intensive year-round vegetable production**

There are several systems based on intensive production of vegetables year-round on the same piece of land. The Center will focus on two: peri-urban and homestead production systems.

Peri-urban production, which is rapidly gaining importance, supplies fresh perishable vegetables, generates jobs, allows economical use of even small pieces of land, can adjust quickly to market needs, and can recycle urban waste. More importantly, peri-urban production increases vegetable supply and income for the urban poor.

Homestead production is important to family diets and especially important to children's health. It makes use of low amounts of external inputs and can absorb high labor inputs, usually from women and children. These systems are often highly developed and utilize the accumulated knowledge of women vegetable farmers.

AVRDC will make strong efforts to improve this production system by helping people make sound production choices utilizing the many crop varieties and technologies already available. Hence the Center's interest in developing knowledge databases and decision-making tools that take into account a number of variables, including market demand.

Priority crops

To choose the crops targeted for sustained research attention, the Center considered the following: crop value (nutritive and monetary value), the needs of AVRDC's ultimate beneficiaries (producers and consumers), the chance of success, and our own capacity for problem-solving. Practicalities, such as the long time it takes to improve crops, require that we focus sharply. That said, if funds were made available, AVRDC would also work on other crops that might serve as important sources of micronutrients in the diets of the most vulnerable sectors of society.

- Tomato can be grown, if genetically adapted, in almost all agroecological zones. Work on the crop will continue, making full use of the Center's experience and its vast genetic resources.

-
- Mungbean and soybean research will focus on reducing through adaptive research and extension of promising lines the large yield gap between experimental stations and farmers' fields. Aside from their high nutritive value, legumes can help sustain soil productivity. They are essential if crop production is to be increased using fewer inputs. Work will focus mostly on South Asia. Vegetable soybean, a labor-intensive crop, has great potential in low-wage countries where it can generate on- and off-farm employment.
 - Indigenous and fast-growing leafy vegetables will be among a diverse group of vegetables the Center plans to evaluate for nutritional value and their potential to fit in production systems. Data will be collected in order to develop production decision-making tools.
 - Peppers, eggplant, and alliums will be improved for yield stability through improved cultural practices and resistance to diseases and insect pests. Some varietal improvement work will focus on improved quality for better utilization. Integrated pest management (IPM) will be developed to reduce dependence on pesticides.

Partnerships

AVRDC believes that it is in the interest of international agricultural research centers (IARCs), NARS, NGOs, and the private sector to fashion a better division of labor.

NARS

National agricultural research systems remain AVRDC's principal partners. In fact, all of AVRDC's work is done in collaboration with NARS. As NARS gain strength, they assume more and more responsibility. The Center adjusts its programs accordingly. Much effort will be given, therefore, to strengthening partnerships through collaborative research, networks, and joint projects.

Other IARCs

AVRDC will continue to look for productive partnerships with the world's many capable IARCs. A research system can be more than the sum of its parts.

Advanced laboratories

AVRDC has signed memoranda of understanding with advanced laboratories. By working with universities, specialized public-sector institutes, and private labs, the Center hopes to maximize effective use of resources for vegetable research.

NGOs

Close collaboration with NGOs could help ensure that farmers are able to realize the benefits of the Center's work. AVRDC will seek closer contact with organizations experienced in adaptive research and development. Specifically, the Center will work closely with those NGOs that run efficient operations.

Private sector

The private sector plays a critical role in all aspects of vegetable production and development. AVRDC will take advantage of this reality and explore possibilities for collaboration.

AVRDC's systems approach in brief

- Prioritize research after taking into account the entire production and consumption system. Focus problem-solving on aspects of the system where vegetables hold the greatest promise of improving well-being.
- Focus on regions and seasons where nutrition and income concerns are most critical, yet likely to benefit from vegetable research. Selection of commodities for research should be based on their potential for improving those systems which have the broadest adaptation in tropical and subtropical environments.
- Choose research that benefits whole communities: producers and consumers. Research should create employment opportunities for the rural and suburban landless populations so that they can become valuable resources to speed up the development process.
- Design research after taking into account the capacities of all partners. Consultation with all parties concerned should be regular and interactive. A holistic approach to problem identification and problem solving should be promoted. In addition to the participation of farmers, the approach should consider factors such as trade, finance, and related service industries.
- Make full use of available technologies. The research process should include thorough assessment of what is available with a view to integrating technologies for effectiveness and efficiency.
- Ensure that research is impact driven. Sites for adaptive research can be identified more accurately when the conditions and environment for adaptation are well defined.
- Adopt a truly interdisciplinary approach at all research stages. Teams are adjusted to match the nature and stage of each project. A thorough understanding of the systems that will adapt the research outputs is essential to an end-user-friendly technology-development process.
- Account for change. Research outputs should be assessed for their potential future value, and for their value in different environments.

The systems approach

AVRDC is acutely aware that it must stay in tune with the natural, political, and socioeconomic environments that affect its research cooperators and its ultimate clients: farm families in the developing world and all vegetable consumers. In this five-year plan, AVRDC has demonstrated its commitment to change and the complex diversity which shapes its work. It is the *systems approach* and it distinguishes this plan from previous ones.

The Center has always understood that it is not enough to develop higher yielding varieties or to develop technologies which push back the margins of crop cultivation. Its technologies have had to make useful sense to the people for which they were intended. For instance, higher-yielding varieties are not a priority when produce rots in the field for lack of labor. Similarly, the value of fitting a crop to a new locale should be weighed against the potential for improving indigenous crops. And new technologies are not necessarily the best answer. Much more could be done with existing technologies — only through adaptation can invention bear fruit.

These are just a few examples which illustrate the need for a *systems approach* to problem solving, one that takes into account all major factors, from climate to markets to preferences that affect and influence farmers and consumers. It means doing the right thing, at the right time, in the right place.

AVRDC serves best when it is a catalyst and facilitator of research, and a research center of last resort. Of course the Center has and will continue to produce improved germplasm and improved technologies, but it is the Center's methodologies, protocols, and approach to problem solving that stand to have the biggest impact in the years to come.

Every program and project detailed on the following pages is a product of this approach. The goal is enhanced well-being of people, not just enhanced performance of crops and technologies.

What has been the impact?

AVRDC believes in evolutionary development, not in radical change. The previous five-year action plan period brought more encouraging progress.

Improved germplasm benefits farmers and consumers worldwide

AVRDC improved vegetable germplasm benefits farmers and consumers the world over. For instance, nearly one million hectares in China are planted to the Center's improved mungbean. As of 1997, 25 Chinese cabbage lines, 56 mungbean lines, 39 grain and vegetable soybean lines, 11 sweet potato lines, and 91 tomato lines had been officially released in 87 countries. And gains from vegetable R&D are equitably distributed among producers and consumers.

Vegetable IPM now serves farmers, consumers, and the environment

An AVRDC-developed IPM system for diamondback moth has reduced spraying in Malaysia by as much as 86%, in Indonesia by 51%, and in the Philippines by 61%. In the Philippines alone, this amounts to an annual saving of US\$10 million for farmers and a cleaner, safer environment.

Regional programs and subregional networks expanded

AVRDC has been an effective catalyst in the establishment of research networks in Southeast Asia, South Asia, the Mekong region, Southern Africa, and Central America. These networks bridge borders and promote South-South cooperation, facilitating the spread of improved plant germplasm and technologies. For example, sources of stable bacterial wilt resistance in eggplant and tomato were confirmed through network collaboration with NARS.

Human resources developed to ensure effective partnerships

By working in close partnership with NARS, the Center's research better meets the needs of respective target areas and economizes on capital and time investments. It also helps AVRDC gain experiences needed to ensure relevance of research outputs. In addition, AVRDC conducts formal skills training, produces important multi-language technical and training materials, and gives wide access to published research through the Center's library services.

Biotechnologies adapted for increased research efficiency

AVRDC has made progress in utilizing modern biotechnological tools to reinforce and supplement conventional varietal improvement approaches. For instance, the Center's scientists use DNA-based diagnostic methods that effectively and efficiently identify a wide range of disease strains.

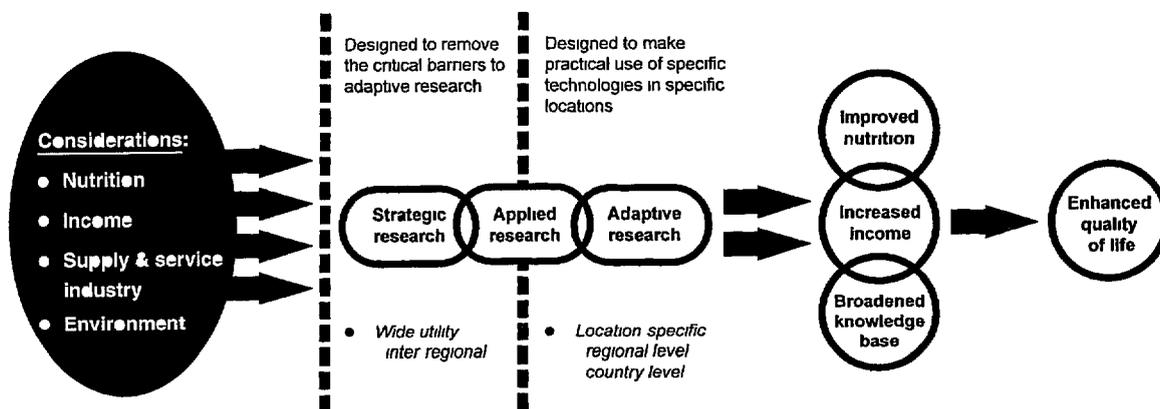
AVRDC's next five years in research & development

As the principal international center dedicated to vegetables in the tropics AVRDC will be a potent catalyst and information resource center for vegetable R&D across borders and across regions

In this plan more attention is paid to strategic research This involves the creation and improvement of research concepts methodologies and research tools By doing so AVRDC is increasing its role as facilitator for NARS committed to moving into more demanding levels of research Activities such as training and information services are in this plan modified and expanded with this in mind

In addition AVRDC's strategic research will help address the socioeconomic constraints to technology adaptation and adoption which in turn will help to close the often wide gap between potential yields and farmers' actual yields

The anticipated outputs of the strategic research have one thing in common they remove specific barriers to the success of applied and adaptive research conducted by NARS In this way the benefits of each output are multiplied many-fold across regions



The vegetable research continuum

The ability of NARS to conduct applied and adaptive research will be further strengthened through the logical integration of international regional public and private resources

Improved crop quality increased yield and increased incomes for farmers are the main objectives of the following 12 projects These projects support AVRDC's higher level objective of development in the broadest sense communities of healthy people able to enhance their own quality of life All of the projects take into account the critical

need to protect the environment – to save water, conserve and improve the soil, and make efficient use of inputs. In the process, vegetables will be made a much more constructive component of various production systems.

We distinguish three programs:

Program I includes three projects focused on production systems that feature vegetables in cereal-based cropping systems. Program II includes four projects focused on intensive year-round vegetable production – in particular, peri-urban and home-stead systems. Together, these systems account for more than 80 percent of all vegetables grown. Program III includes five projects aimed at strengthening partnerships between and among AVRDC and its R&D collaborators, and at ensuring biodiversity in developing countries.

Program I Vegetables in cereal-based systems

The aim of Program I (projects 1-3) is to increase the efficiency of cereal-based vegetable production systems and develop new sustainable cereal-vegetable cropping systems which maximize returns to land, labor, and capital without adverse effects to the environment. The approach involves strategic research to develop technologies and research methodologies important to NARS. Improved technologies can include improved breeding materials or production techniques. Methodologies might include a practical means to identify plants resistant to diseases and insects. The key is integration of available and new technologies following a systems approach.

Vegetables in cereal-based cropping systems

- increase production per unit of land area through intensified cropping
- help ensure cropping system sustainability through crop rotation, recycling of unused plant parts, and reduction in the use of agrochemicals
- make available more vegetables for human consumption, especially in off seasons
- diversify incomes, regularize cash flow, and reduce risk
- make more efficient use of labor and other resources
- provide a catalyst for infrastructure development and growth of local service industries

Project 1 BREAKING BARRIERS
Off-season tomato, pepper and eggplant

Objective

Increased availability of solanaceous vegetables during the off-season. To extend these crops to more cereal-based cropping systems in the tropics in order to give farmers more production choices

Approach

Develop and improve integrated technologies for tomato production in the hot-wet and hot-dry seasons in the lowland tropics. Varietal development will be employed to supplement the development of management practices for various production systems and methodologies will be developed which increase efficiency. Varietal development will entail conventional crossing, interspecies hybridization and if necessary transformation.

Improve crop management practices for peppers, improve heat-tolerant sweet bell pepper germplasm and develop multiple-disease-resistant chili pepper lines in order to reduce supply and price fluctuations across seasons and locations in the tropical lowlands. Biotechnology tools such as molecular markers will be used to increase research efficiency.

Exchange and evaluate eggplant germplasm including improved lines through established testing networks.

Expected Outputs

- Determine fresh-market tomato lines with heat tolerance and resistance to major diseases made available for field evaluation
- Better understanding of the distribution of strains of leaf curl virus and resistance sources in Southeast Asia and South Asia
- Integrated management technologies to control leaf curl virus including use of improved germplasm in combination with other control measures
- Late blight resistance incorporated into advanced lines for production in the highlands especially in Africa
- Management packages better able to control bacterial wilt in tomato
- An expert system for tropical tomato production
- Management packages including IPM to counter major diseases of chili pepper in hot-dry and hot-wet environments. The diseases targeted will include cucumber mosaic virus, chili vein mottle virus, anthracnose, and bacterial wilt
- Germplasm of sweet bell pepper improved for heat tolerance
- Improved breeding efficiency of peppers due to better understanding of the inheritance of major traits and through the use of molecular tools
- Eggplant materials evaluated for resistance to shoot borers and bacterial wilt

Project 2 BREAKING BARRIERS
Off-season onion and garlic

Objective

Reduced fluctuations in supply and price of onion and garlic in the tropics through increased domestic production and improved storability

Approach

Increase productivity and storability of onion in the cool-dry season. Improve onion production systems for extended production in the hot-dry season.

Develop methodologies and technologies to improve clonal selection and eliminate viruses in garlic.

Expected Outputs

- Production systems for high-yielding, long-storing onion lines (more than 30 t/ha and longer than four months at ambient conditions) for the cool-dry season.
- Onion germplasm enhanced through interspecies hybridization and selection for increased heat tolerance and resistance to stemphylium leaf blight, purple blotch, and anthracnose.
- Onion lines yielding >25 t/ha within 120 days in the field and production technologies for hot-dry environments.
- Garlic lines selected for better yield, good storability, resistance to major virus diseases and stemphylium leaf blight.
- Methodologies for producing virus-free garlic and true-seed shallot lines introduced.

Project 3 BREAKING BARRIERS
Legumes for crop diversification

Objective

Expanded production of legumes in cereal-based cropping systems for additional protein, crop diversification, soil enhancement, and increased incomes for farmers.

Approach

Evaluate and promote, through partnerships and networking, the potential of improved, short-duration mungbean and soybean lines (including vegetable soybean) to fit cereal-based cropping systems.

Expected Outputs

- Improved methods developed and applied for incorporating mungbean yellow mosaic virus and bruchid resistance into early-maturing and high-yielding mungbean lines for South Asia
- In collaboration with sub-regional networks in South Asia, Southeast Asia and the Mekong region legumes potential for adaptation evaluated in various cropping systems
- Improved mungbean and vegetable soybean germplasm enhanced for quality including increased sulfur-containing amino acids
- Improved cereal-legume systems making use of farmer-proven practices tested in order to close the gap between research farm yields and farmers yields in major agroenvironments
- An expert system for mungbean production

Program II: Year-round vegetable production systems

The aim of Program II (projects 4-7) is to identify the biological and socioeconomic constraints affecting peri-urban and homestead production systems throughout the year and to develop ways to overcome them. Much focus will be given to the use of fast-growing leafy vegetables and indigenous vegetables for enhanced nutrition and income generation.

Peri urban and homestead production systems

- enhance vegetable supply
- diversify diets and supply micronutrients for balanced nutrition
- reduce environmental contamination in peri-urban areas
- provide alternative income and job opportunities especially for women
- create vegetable-related supply and service sector jobs for small landholders and the landless

Project 4 ENHANCING QUALITY OF LIFE
*Peri-urban and household
vegetable production*

Objective

Collect assess and improve technologies – including crops and production practices – for peri-urban and homestead production systems

Approach

Knowledge of existing technologies will be obtained through literature search a questionnaire program and institute-to-institute person-to-person inquiries in conjunction with surveys of peri-urban production sites Prototype production systems will be established

Expected Outputs

- Varieties and/or species assessed for performance in specific agroenvironments and production systems The information will be maintained in an accessible and searchable database and used in personal-computer-based decision-making tools
- Information collected on technologies useful in diverse socioeconomic and growing environments
- Recommendations for incorporating diverse crops into efficient sustainable and cost-effective cropping sequences formulated
- Recommendations relating to proven cultural practices – such as seedling production grafting fertilizer placement and protected cultivation – which avoid or reduce off-season crop stress published
- Soil fertility and water-management guidelines established that take into account availability of nutrients water sources soil properties the environment and economic considerations

Project 5 ENHANCING QUALITY OF LIFE
Safer vegetable pest management

Objective

Cost-effective and safe means of controlling vegetable pests with reduced reliance on pesticides IPM will be made an integral part of production systems

Approach

Working with NARS researchers AVRDC will set up prototype IPM units making timely use of a variety of insect and disease control practices including use of AVRDC-improved insect- and disease-resistant lines The Center will also work with users to improve community-based IPM programs for pest control

Expected Outputs

- Major insect and disease constraints to peri-urban production identified
- Improved IPM component technologies – predators trap crops insect pathogens natural pesticides sex pheromones antibacterial or antifungal agents soil amendments cultural practices and prudent use of pesticides – for priority diseases and insect pests developed
- IPM practiced by farmers documented and validated in selected agroenvironments
- Methodologies for insect and disease diagnosis and control compiled which can be used by NARS to produce sound recommendations

Project 6 ENHANCING QUALITY OF LIFE *Socioeconomic and nutritional benefits from vegetables*

Objectives

Enhanced vegetable research and development through a better understanding of the socioeconomic and nutritional aspects of vegetables in selected regions

Approach

This project will entail an interdisciplinary effort including varietal improvement for enhanced nutritive value as well as data collection and analysis regarding the nutritional value of indigenous vegetables

Expected Outputs

- Trend analyses of vegetable consumption and supply in selected major cities to generate a better understanding of the socioeconomic constraints to vegetable production and consumption as well as the constraints to technology adoption
- Nutrient content analyses of potentially useful indigenous crops grown in selected environments
- Practical methods – including recipes and modes of food preparation – for enhancing the bioavailability of vitamin A and iron
- A database of nutritional and socioeconomic information related to vegetables
- Impact analyses of improved technologies for vegetable production
- Tomato improved for increased beta-carotene and peppers improved for increased vitamins A and C

Project 7 ENHANCING QUALITY OF LIFE
*Decision-making tools
for vegetable production*

Objectives

Improved decision-making tools for NARS extension services and nongovernmental agencies to increase the effectiveness and efficiency of development efforts in vegetable production

Approach

The Center will integrate existing and AVRDC-generated databases to produce computer-based tools to help extensionists formulate recommendations for enhanced year-round vegetable production

Expected Outputs

- Soil- water- and crop-management data to complement existing crop databases
- A logical framework which simulates the vegetable production decision-making process
- A personal-computer-based decision-making tool for designing profitable and sustainable year-round production systems that provide nutritious and safe vegetables

Program III. Collaboration in research and germplasm management

This program (projects 8-12) will play a key role in maximizing AVRDC's contributions to its NARS partners drawing on the inputs of advanced labs NGOs NARS, and the private sector Through multidisciplinary collaboration it will make available the outputs of these partnerships for use by national research and extension systems It will continue to build up NARS research capacity and will promote collaboration between national systems It will intensify the collection conservation and use of vegetable germplasm including indigenous vegetables And it will ensure that AVRDC research is attuned to the needs of its NARS partners

Increased collaboration will

- spread new and existing improved production technologies
- increase the adoption of newly developed or improved research tools
- improve the ability to conduct research as a team pool talent for increased efficiency and increased regional productivity

-
- strengthen NARS scientists' leadership role in network-type research
 - entice scientists to research vegetable-related problems
 - help NARS to better conserve and utilize germplasm especially germplasm of indigenous vegetables

Project 8 *STRENGTHENING PARTNERSHIPS*
*Germplasm conservation,
characterization and exchange*

Objective

Improved production and increased biodiversity through collection and exchange of germplasm

Approach

The collection of vegetable genetic resources that AVRDC holds in trust will be expanded characterized and made ever more readily available for exchange and utilization

Expected Outputs

- A comprehensive collection of both cultivated and indigenous vegetable germplasm for use by all interested parties
- A well-characterized and evaluated germplasm collection for AVRDC's priority crops
- Improved technologies and protocols for production of healthy planting materials
- Representative core collections of germplasm for crops with very large germplasm collections such as mungbean tomato and pepper

Project 9 *STRENGTHENING PARTNERSHIPS*
*Collaborative research and networks
for vegetable production*

Objectives

Increased capacity of NARS to perform regional collaborative research and to enhance the adoption and impact of research innovations

Approach

AVRDC will foster and support effective regional and inter-regional research collaboration In particular the Center will facilitate this collaboration using participatory research planning methods and engage directly in collaborative research with NARS partners and advanced laboratories

Expected Outputs

- Sustainable collaborative networks in South Asia, Southern Africa, South-east Asia, and Central America with well-defined research priorities
- Applied research networks to share and evaluate plant germplasm in order to generate a better understanding of pest and host plant interactions across environments for such diseases and insects as bacterial wilt, leaf curl virus, fruit and shoot borers, and mungbean yellow mosaic virus
- Improved methodologies for regional and network testing of improved plant germplasm
- Research teams established which combine skills and resources not available in any single institute
- Strengthened interactions among international and national institutes and between production- and nutrition-oriented institutes

Project 10 STRENGTHENING PARTNERSHIPS
Information exchange on tropical vegetables

Objective

To raise the quality of research in the tropics and subtropics by sharing relevant information

Approach

Develop mechanisms and improve existing ways and means of collecting, collating, and sharing vegetable information

Expected Outputs

- A comprehensive collection of collated documents, including gray literature, related to vegetable R&D from diverse sources
- Guides for mungbean, pepper, and tomato production in the tropics, compendia of vegetable technologies for diverse environments, and IPM extension materials
- Published records of AVRDC scientists, significant research findings, and the proceedings of AVRDC-sponsored workshops and symposia
- Regular publication of *Centerpoint TVIS Newsletter* and other materials
- Germplasm collection's database made available worldwide via the Internet

Project 11 STRENGTHENING PARTNERSHIPS
Training for research and development

Objective

Increased number of competent vegetable researchers in developing countries to conduct relevant problem-solving research

Approach

In addition to research internships and hands-on production-related training AVRDC will seek to provide in close collaboration with advanced educational institutions opportunities at the Center for one- and two-year study programs for graduate students and post-doctoral fellows

Expected Outputs

- Increased interaction between AVRDC and NARS researchers – research interns graduate students and postdoctoral fellows given the opportunity to interact with AVRDC
- Curricula integrating improved production packages computers and management science following a systems approach to decision-making developed
- Greater complementarity achieved between graduate education and vegetable research in the tropics including AVRDC's R&D efforts
- Interdisciplinary R&D activities within NARS promoted
- Training modules making use of a variety of media produced

Project 12 STRENGTHENING PARTNERSHIPS
Technical services

Objective

Enhanced capacity of small- and medium-sized local agribusinesses and public corporations to better serve vegetable producers to create employment and spur socioeconomic development

Approach

Conduct research to better understand the functions and constraints of small- to medium-scale vegetable-related agribusinesses Develop a mechanism to make available the Center's expertise and infrastructure

Expected Outputs

- Better understanding of the roles and operational modes of agribusiness in vegetable production and marketing systems

-
- Technical services made available by the Center in order to improve the efficiency of local agribusinesses. These services might include soil analysis, quality analysis, pathogen identification, disease diagnosis, seed multiplication, and use of molecular tools.
 - More effective collaboration between AVRDC, public corporations, and the private sector. The Center will facilitate the exchange of ideas and experiences between local agribusinesses and NARS, and between agribusiness operators across regions.

Administration

The diversity of vegetables their production in different environments their multifaceted marketing and consumption patterns require problem-solving research teams with a high degree of flexibility and creativity It is equally important that researchers with different disciplinary backgrounds have the ability to work in an interdisciplinary setting Management is continuously challenged to provide an environment that promotes innovation and productivity

The Center is using the following three approaches to achieve its objective of quality management

- A rigid process for selection of researchable problems that have a high chance of success
- A high degree of cost consciousness is maintained to ensure value for money in whatever we do
- Every researcher at the Center strives to ensure that his or her research results are relevant and address the needs of vegetable growers and consumers

With rising costs stagnant or even declining budgets already demanding research becomes even more difficult We must confront knowledge yield and resource gaps simultaneously

Administration alone will not be able to change this unfavorable environment for research But resignation is neither on our agenda nor an option and we propose the following actions to counter this negative situation

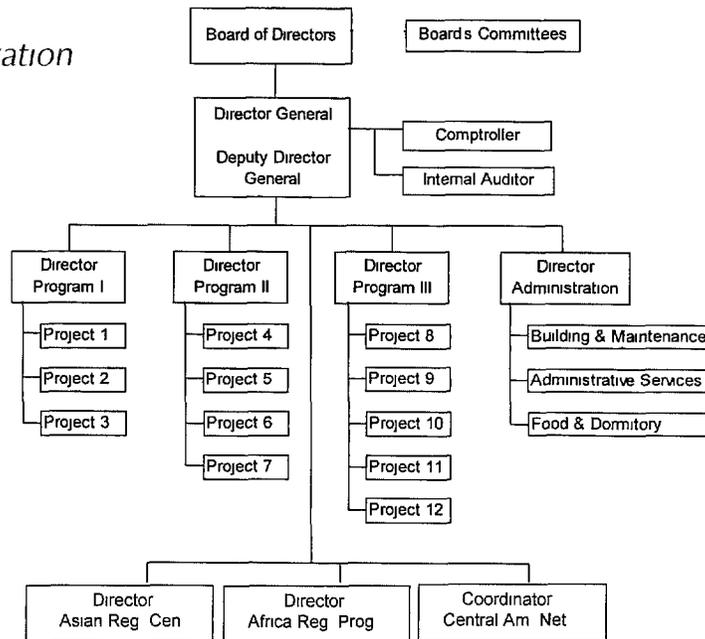
- Establish even closer links with NARS in training and research collaboration to enable us to focus on key areas of urgent and relevant research where chances for success are the greatest
- Explore avenues for saving labor costs in all operations, without capital investment of a level we cannot afford These efforts are specifically needed due to the highly competitive environment created by the industrialization of the host country
- Attract traditional and new donors to support the specific projects described in this plan

Core funding at AVRDC has always been low compared to core funding at other IARCs In the future however our budget will depend to an even larger degree on special project funding Given this trend precise planning cost-conscious implementation and rigid monitoring will become more important than ever

This is reflected in our new organizational setup Each of the three programs is headed by a director who prepares work plans and research proposals supervises project implementation and oversees allocation of resources A coordinator is assigned to each of the 12 projects

Beyond the program-project structure AVRDC is divided into disciplinary units led by a senior staff member. The effectiveness of each unit and the allocation of human resources for each project will be reviewed annually. Likewise, each of AVRDC's two regional programs – the Asian Regional Center in Thailand and the Africa Regional Program in Tanzania – is headed by a director. The Center will commission an external review in the third year of the plan.

AVRDC's organization



The number of internationally recruited staff and research associates is at a minimum level and will remain almost unchanged (Table 1). Because funding is not assured and to cope with rising costs, provision will be made for further decreases in support staff. Yet the Center must foster a climate where high staff morale, enthusiasm, and commitment can further grow.

Most of AVRDC's buildings were built 25 years ago. The need for renovation can be seen despite rigorous maintenance management. The Center must use its core funding for this maintenance.

Additional facilities will be built in 1998-2000 to accommodate more postdoctoral fellows, visiting scientists, and graduate students. Modest resources are allocated to replace and upgrade laboratory instruments.

The operational budget will increase slightly from US\$13.2 million in 1998 to US\$16.2 million in 2002, mostly reflecting the cost of inflation (Table 2). Additional funding, even for crucial projects, is expected to be generated primarily through special projects.

The dynamism of this plan is a reflection of our achievements, of the challenges ahead, and of our lasting belief that problems should be viewed as opportunities for finding solutions. We look to the future with optimism and confidence that our stakeholders share this vision.

Beyond present boundaries

This plan of action for 1998-2002 outlines a set of activities that we consider ambitious but realistic. Vegetables are likely to be given increasing importance in the worldwide attack on food, nutrition, and health problems. AVRDC's response to this challenge can make a significant contribution to countries in the tropical and subtropical belt.

AVRDC's first responsibility, of course, is to Asia. Looking ahead to urbanization, serious shortages of land, water, and income opportunities are among the obstacles that will confront the generations to come. We must begin problem-solving today. AVRDC has a special role to play. Along with its headquarters in Taiwan and its regional center in Thailand, the Center has operations in Africa and Latin America, bases from which to build inter-regional cooperation in vegetable research.

The goal of more than doubling present vegetable production will be achieved only with the development of new knowledge, including innovative technologies and new information transfer methods.

The present high level of micronutrient deficiency, which has resulted in disease and even blindness for millions of people, cannot be tolerated in an age when space travel is becoming almost commonplace. Micronutrient-rich vegetables, not fortified foods, are the best option for the future. To that end, the nutritive value of vegetables must be enhanced, making use of advanced technologies. At the same time, higher production levels must be reached by overcoming the present constraints related to climate, water, soil nutrients, and pests. In the future, vegetables will have to be grown in ecosystems that today are described as marginal. Consumer acceptance of vegetables in many societies has been negatively influenced by overuse of fertilizers and pesticides; such overuse must be corrected. AVRDC looks forward to playing an even stronger role in bringing about such developments.

The gap between knowledge generation and its dissemination to vegetable producers in many parts of the world is a major constraint. At the same time, information technologies are developing worldwide at a phenomenal speed. Vegetable farmers are more closely linked to markets than are other agricultural producers. They might and should become pioneers in using modern information tools to enhance vegetable production and improve income through market-oriented decision-making. AVRDC will assist in developing systems for software programs needed by NARS partners to ensure timely and user-relevant vegetable production and market information.

The long-term expansion of vegetable production will depend not only on new technologies, but also on a favorable policy environment at the national level. It will be necessary to encourage environmentally sound production practices in both high-potential and marginal areas. Both public extension services and the private sector should be drawn upon to increase the quantity and quality of vegetable production, including at the homestead level. Greater attention to the role of vegetables should be accorded in planning at all levels. AVRDC will

have an advocacy function in promoting vegetables for nutrition and health

The Center depends on voluntary contributions from its supporters. Funds for international agricultural research are subject to increasing competition. At the same time, there is a growing recognition that vegetable consumption – and hence vegetable production – must be increased. Given this situation, AVRDC believes that funding will go to the institutions that can deliver the best results. It is confident that this action plan provides a framework for an ever-increasing role for the Center in the resolution of worldwide problems dealing with vegetable-based nutrition and health.

Table 1 Projected internationally recruited staff (IRS) and research associates (RA) for 1998 through 2002 (in person equivalents*)

	1998	1999	2000	2001	2002
Program I					
IRS	59	60	60	60	60
RA	20	27	27	27	27
Program II					
IRS	61	60	60	60	60
RA	24	35	35	35	35
Program III					
IRS	100	100	100	100	100
RA	26	28	28	28	28
TOTAL					
IRS	220	220	220	220	220
RA	70	90	90	90	90

* including out posted scientists in regional offices

Table 2 Operational budget requirements, 1998-2002

(US\$ '000)

	1998	1999	2000	2001	2002
Program I					
Core & restricted core	1,592	1,640	1,689	1,740	1,792
Special projects	570	741	912	1,004	1,100
Program II					
Core & restricted core	1,510	1,555	1,602	1,650	1,700
Special projects	529	582	620	682	750
Program III					
Core & restricted core	1,353	1,843	1,898	1,955	2,014
Special projects	2,712	2,911	3,202	3,522	3,875
Regional Program					
Core & restricted core	632	754	777	800	824
Special projects	850	935	1,029	1,131	1,244
Administration					
Core & restricted core	2,353	2,424	2,496	2,571	2,648
Subtotal					
Core & restricted core	7,440	8,216	8,462	8,716	8,978
Special projects	4,661	5,169	5,763	6,339	6,969
Capital requirements	1,078	1,000	200	200	200
Total	13,179	14,385	14,425	15,255	16,147

Regional research networks

Collaborative Network for Vegetable Research and Development in Southern Africa (CONVERDS)

Angola
Botswana
Lesotho
Malawi
Mozambique
Namibia
Swaziland
Tanzania
Zambia
Zimbabwe

Collaborative Network for Vegetable Research and Development in Central America (REDCAHOR)

Costa Rica
Dominican Republic
El Salvador
Guatemala
Honduras
Nicaragua
Panama



South Asian Vegetable Research Network (SAVERNET)

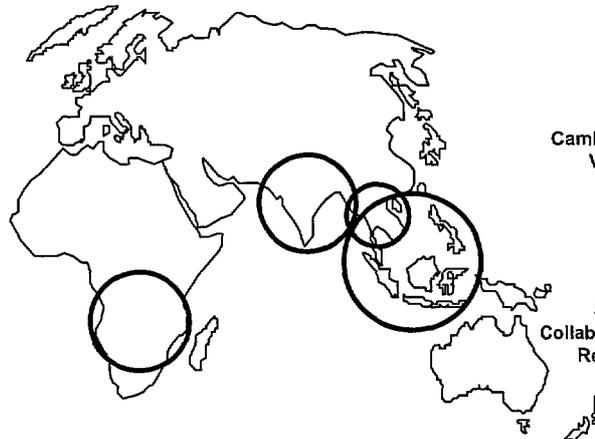
Bangladesh
Bhutan
India
Nepal
Pakistan
Sri Lanka

Cambodia Laos and Vietnam Network (CLVNET)

Cambodia
Laos
Vietnam

Southeast Asian Collaborative Vegetable Research Network (AVNET)

Indonesia
Malaysia
Philippines
Thailand



AVRDC has helped establish and continues to administer five international regional research networks. The networks dissolve borders for the good of vegetable R&D.



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