



PROTEIN RESOURCES AND  
TECHNOLOGY:  
STATUS AND RESEARCH NEEDS

edited by  
Max Milner  
Nevin S. Scrimshaw  
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Massachusetts Institute of Technology

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# Preface

The organization and execution of this study, from its inception, had two coordinated objectives in view. The first was to satisfy as quickly as possible the needs of NSF/RANN for a list of recommendations, including desirable funding levels, for support of research into various protein resources and technologies. The second objective, whose attainment required a longer-term approach, involved the commissioning of eminent specialists to prepare two series of comprehensive analyses. The first dealt with a broad group of issues which are common to the development and utilization of many protein resources. The second group of studies dealt with the status, potential, and research needs of a selected list of protein resources.

Thus, under the comprehensive title for this series, *Protein Resources and Technology: Status and Research Needs*, (Section I) "Summary and Research Recommendations" was completed by MIT and published and disseminated by NSF/RANN in December, 1975. Based on extended summaries of the individual chapters prepared by the commissioned specialists, this document supported and justified a carefully selected list of research proposals and funding recommendations. It should be emphasized that the selection of research topics and funding levels as recommended to NSF in section I, although it took carefully into account the analyses and suggestions of the cooperating specialists, was solely the responsibility of the MIT group. This priority list of selected recommendations should in no way minimize the significance of the research recommendations proposed by the cooperating experts in the context of their full analyses of various specific common issues, technologies, and resources as presented in sections II and III.

The titles of the three sections with an indication of their contents, can be listed as follows:

## SECTION I. SUMMARY AND RESEARCH RECOMMENDATIONS

Section I recommends NSF/RANN support of intermediate- and long-term research for strengthening United States food and feed production capacities. It provides a brief analysis of socioeconomic and related factors which influence protein supply and consumption, an assessment of scientific and technical issues common to various protein materials, and brief reviews of the status of a variety of specific protein resources significant in terms of U.S. needs and production capabilities.

## SECTION II. COMMON ISSUES AND PROBLEMS IN PROTEIN RESOURCE DEVELOPMENT

The second volume opens with a retrospective and prospective assessment of U.S. and world protein production and consumption. Succeeding chapters deal with legal, technical, and institutional constraints. These are followed by a series of studies dealing comprehensively with the following protein-related issues: nutrition, toxicology, innovative technology for protein utilization, constraints on improving protein quality in plants by genetic means, and nitrogen and carbon fixation.

## SECTION III. A REVIEW OF SPECIFIC PROTEIN RESOURCES

This area is reviewed in thirteen chapters dealing variously with: grain crops for food and feed; cereal protein technology; oilseed proteins; food legumes; livestock animal production; animal protein from dairy products; animal protein from meat, poultry, and eggs; aquatic proteins; potatoes; nonphotosynthetic single-cell protein; photosynthetic single-cell protein; leaf protein; and chemical synthesis of nutrients.

Attention should be drawn to the fact that while this monograph takes into account the global scene as regards food and protein resources, the primary purpose of these volumes is to provide justification for the support of research into common problems affecting those protein supplies and technologies which are pertinent primarily to the needs of the United States.

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*November 1977*

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Our thanks are due also to the many reviewers from government who carefully scrutinized the draft manuscripts prepared for the study and who added invaluable comments and suggestions for improvement of the final report.

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# Foreword

The question of the availability of adequate protein resources for domestic consumption and export has been raised often in recent years. The issue has become closely involved with the cost and availability of energy, the quality of the environment, and the growth of population. Energy shortages and environmental considerations can reduce production and increase cost while population growth demand increased production at reasonable prices.

This study has had as its objective the evaluation of the United States' ability to meet both its domestic needs and international food commitments in the face of these constraints. Given the land and climate resources which the United States possesses, how can we meet the projected protein needs for both the intermediate and long term? Could research result in substantial productivity gains? Which areas of research or development should receive priority and which goals could be achieved within a reasonable planning horizon?

These were the questions which this study set out to try to answer. Under the leadership of Nevin Scrimshaw, Daniel Wang and Max Milner of the Massachusetts Institute of Technology, groups of experts from industry, government, and universities were called in to address these questions. The result reflects the many years of pertinent experience of each of the contributors coupled with the perspective of their individual disciplines. We trust that the research recommendations will serve to illuminate our protein resource problems and provide a basis for fruitful debate on the formulation of a longer term protein research program.

It has been gratifying to observe the cooperative efforts of industry, university and government experts in this study. The thanks of the National Science Foundation go to these contributors for their help in making this study of conventional and nonconventional protein resources possible.

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# Contents

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PREFACE v

ACKNOWLEDGMENTS vi

## SECTION I SUMMARY AND RESEARCH RECOMMENDATIONS

1	Objectives and Research Recommendations	3
	Major determinants of research recommendations	4
	Research recommendations	5
	Organization, objectives and scope of the study	11
	The measurement system used in this study	11
2	Factors Affecting Protein Supply and Demand	12
	Recent trends in food supply and demand	12
	Assessment of future needs and trends	14
	Legal, technical, institutional and other factors affecting protein supply and demand	14
3	Common Issues in the Development and Utilization of Protein Resources	19
	Nutrition	19
	Toxicology	20
	Innovative technology for protein utilization	21
	Constraints on improving protein quality in plants by genetic means	22
	Biological nitrogen fixation	23
4	Status and Potential of Specific Resources	24
	Grain crops for food and feed	24
	Cereal protein technology	26
	Oilseed proteins	27

Food legumes	27
Livestock animals	29
Animal protein from dairy products	30
Animal protein from meat, poultry and eggs	32
Aquatic proteins	33
Potatoes	35
Nonphotosynthetic single-cell protein	36
Photosynthetic single-cell protein	39
Leaf protein	40
Chemical synthesis of nutrients	41

## SECTION II COMMON ISSUES AND PROBLEMS IN PROTEIN RESOURCE DEVELOPMENT

5	United States and World Protein Production and Consumption	47
	Introduction	47
	Trends in U.S. domestic food production and disposition	48
	Projected protein demand and supply for domestic and export markets, 1980, 1985, and 2000: A review of two recent studies	58
	Qualifications of the demand and supply projections and considerations of optimality	66
	The world food situation and the role of the U.S. as a food exporter	75
	Future economic research	81
6	Energy Constraints in Protein Production	86
	Introduction	86
	Interrelationships of energy, land, and labor in protein production	86
	Vegetable protein production	87
	Energy inputs for animal protein production	88
	Conclusion	89
7	Legal and Regulatory Barriers to the Introduction of Novel Protein Foods	90
8	The Politics of New Protein: Obstacles and Opportunities Facing Research and Development	97
	Introduction	97
	Political obstacles to research	98
	Political opportunities from expanded protein resources	103
	Conclusion	109
9	The Marketing Factor for Nonconventional-Protein Products	111
	Marketing management for new food products	111
	The marketing and food technology interface	116
	New protein resources: Marketing problems and prospects	118
	Case studies	126
	Marketing research priorities	134
	Public policy considerations	134
10	Nutritional Evaluation of Proteins and Protein Requirements	136
	Introduction	136
	Some metabolic aspects of the daily protein requirement	137

	Approaches and methods in the assessment of protein and amino acid requirements	141
	Current data on the essential amino acid requirements of man	149
	Current estimates of the protein requirements of man	154
	Protein requirements and evaluation of protein quality	157
	Dietary energy, nitrogen metabolism and protein utilization	164
	Conclusions and recommendations	166
	Specific recommendations	167
11	Toxicological Aspects of Protein Production and Processing	174
	Introduction	174
	Preclinical testing of novel sources of protein for human consumption	175
	Clinical testing of novel protein sources	177
	Nutritional and safety aspects of novel protein sources for animal feeding	179
	Special considerations in the testing of single-cell protein	180
	General recommendations	181
	Specific recommendations	182
12	Basic Food Science and Technology Problems Affecting the Properties and Processing of Protein Resources	184
	Introduction	184
	Rationale for the need for new approaches	185
	Goals, approaches and coordination of protein utilization research	186
	Research recommendations	189
13	The Constraints on Improving Protein Quality in Plants by Genetic Means	195
14	Research on Nitrogen and Carbon Input to Increase Domestic Crop Protein Production	204
	Introduction	204
	Nitrogen input	205
	Carbon input	224
	Conclusion	230
	<b>SECTION III A REVIEW OF SPECIFIC PROTEIN RESOURCES</b>	
15	Grain Crops	239
	Description of resource	239
	Potential for expanded development, production and utilization	244
	Constraints or problems limiting production	247
	Status of research and development activities	250
	Advantages and disadvantages of protein production from grain crops	251
	Research needs	252
16	Cereal Proteins from Grain Processing	256
	Cereal grain protein products	256
	Potential for expanded development, production, and utilization	271
	Research: Status and future needs	273
17	Oilseed Proteins	278
	Oilseed protein resources	278



	Soybeans	278
	Cottonseed	290
	Peanuts	295
	Sunflowers	299
18	Food Legumes as a Protein Source	302
	The food legume resource	302
	Potential for expanded production, product development, and utilization	307
	Constraints or problems limiting production, and how they may be overcome	309
	Status of research and development activities	313
	Research funding	316
	Research role of universities, U.S. government, commercial firms, and non-profit groups	316
19	Livestock Animal Production	318
	Introduction and overview	318
	Animal and animal product production in the U.S.	324
	Appendix: Research projects in livestock animal production	333
20	Proteins from Dairy Products	348
	Part 1: Primary Dairy Products	348
	Description of resources	348
	Potential for expanded development, production and utilization of dairy products	354
	Constraints limiting production and use	355
	The impact and role of dairy analogs	360
	Present and future research and development activities	365
	Part 2: Secondary Dairy Products	374
	Description of resource	374
	Expanded production and utilization	379
	Constraints	380
	Present research and development activities	381
	Future research needs	385
21	Animal Protein from Meat, Poultry and Eggs	389
	Introduction	389
	Conclusions and recommendations	390
	Description of resource	391
	Potential for expanded development, production and utilization	406
	Constraints or problems limiting production	410
	Status of research and development activities	418
	Research in the short, intermediate and long term	419
22	Aquatic Proteins	427
	Part 1: Aquatic Protein Resources	427
	Introduction	427
	The resource base	427
	Aquatic protein products	435
	Research and development needs	437
	Constraints	439
	Part 2: Status of U.S. Fishery Stocks	445
	Un- and underutilized species	445