North Carolina State University

School of Agriculture and Life Sciences
Academic Affairs, Extension & Research

Academic Affairs
Office of the Director
Box 7601, Raleigh 27695-7601
(919) 737-2614

December 13, 1984

Dr. William J. Jordan
Professor and Head
Department of Speech-Communication
Box 8104
NCSU Campus

Dear Dr. Jordan:

We appreciate your writing us concerning the program that your department is offering in the overall communication competency of students. We are very much interested in the project. The matter has been discussed with the Curriculum Committee for the School. It is the consensus of this group that we should operate by referral. We shall work with our faculty and call their attention to this opportunity for assistance for students who have communication handicaps.

Thank you for calling our attention to this program.

Sincerely,

E. W. Glazener
Associate Dean and
Director of Academic Affairs

EWG/fbk

cc: Dr. Lawrence M. Clark

North Carolina State University

Office of the Dean
Box 7601
Raleigh, NC 27695-7601
919-737-2668

School of Agriculture and Life Science
Academic Affairs, Extension & Research

November 5, 1984

Chancellor Bruce R. Poulton
A Holladay Hall
Box 7101
NCSU Campus

Dear Bruce:

This is in reference to our earlier conversation to confirm my desire to relinquish my appointment as Dean of the School of Agriculture and Life Sciences in the summer of 1985. It has been an honor and a privilege to serve as Dean of the only School with which I have been affiliated during my professional career. I shall do all that I can to maintain the momentum of our School programs until a successor is in place. I would hope that this transition could be arranged by July 31, 1985 or soon thereafter.

It is my desire to continue actively as a member of the Department of Animal Science; although, the details of this affiliation are not urgent at this time. I did want to provide this advance statement of my intention to allow you to initiate the selection process.

It is my feeling, which I sense is shared by others, that our School is in a strong position to continue as a national leader yet remain sensitive to the needs of the citizens of the State. On behalf of the School, I want to express appreciation for the encouragement the University administration has given us in support of our mission and goals.

Sincerely,

J. E. Legates, Dean

NOV 6 - 1984

JEL:rs

cc: Provost Nash N. Winstead

Sent copy to Mary

AGRICULTURAL
EXTENSION
SERVICE

North Carolina State University
School of Agriculture and Life Sciences

Agricultural Extension Service
Office of the Director
Box 7602
Raleigh, N. C. 27695-7602

Dear Applicant:

We have your letter inquiring about employment opportunities with the N. C. Agricultural Extension Service. Thank you for your request. We hope the following information will be of assistance.

Positions as field faculty members of N. C. State University are available in agriculture, home economics, 4-H youth development, and community and rural development work. Minimum educational requirement is the B.S. or B.A. degree with a 2.5 overall grade point average or a 3.0 in the major (4.0 basis). Starting salary for the B.S. degree is $16,500 and $18,000 for the M.S. level. Consideration is given advanced studies and work experience applicable to the Extension Service in placements and salary determination.

Application procedures consist of completion of an application with transcript and three references. Following processing, the application will be considered for position vacancies in areas of academic qualification. Position vacancy notices are mailed monthly to various universities, state extension services, and to each county extension office in North Carolina.

Interviews for positions are required; however, expenses for an interview trip must be borne by the applicant. Interviews are scheduled by the District Chairmen on the basis of their active interest in the applicant.

We are interested in securing the best qualified persons for our positions. If you desire to apply, you may complete the enclosed application and return it to our office.

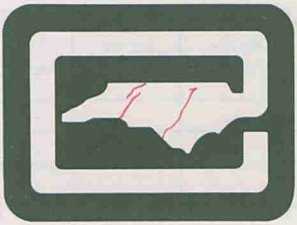
Sincerely,

Michael A. Davis

Michael A. Davis
Extension Personnel Development
Specialist

MAD/edm
Enclosure

Application for Employment



PLEASE RETURN TO
MICHAEL A. DAVIS
PERSONNEL DEV. SPECIALIST
BOX 7602
RALEIGH, N. C. 27695-7602

Agricultural Extension Service

NORTH CAROLINA STATE UNIVERSITY AT RALEIGH

Full Name (print) _____
Last First Middle (Maiden)

Present Address _____ Telephone( ) _____
Area Code Number

_____
City State Zip Code

Permanent Address _____ Telephone( ) _____
Area Code Number

_____
City State Zip Code

Name of Parent or Guardian _____

Address _____ Telephone( ) _____
City State Zip Code Area Code Number

Position for which you are making application _____

Salary expected $ _____ Date Available to begin work _____

Geographic preference:
(check all that apply)
Mountains _____
Piedmont _____
Coastal Plain _____

Degree & Major Field: _____

Concentration: _____

Date of Application: _____

EDUCATIONAL RECORD

High school from which you graduated:

Name _____ State _____

County _____ From _____ To _____

Name and Location of College or University Attended	From Mo/Yr	To Mo/Yr	Degrees Conferred Mo/Yr	Degrees Conferred Title	Major

REQUEST THE REGISTRAR OF EACH JUNIOR COLLEGE, COLLEGE OR UNIVERSITY ATTENDED TO SEND AN OFFICIAL TRANSCRIPT DIRECTLY TO THE EXTENSION PERSONNEL DEVELOPMENT SPECIALIST. A final transcript indicating degree conferred must be received before hiring decision is made.

OVERALL COLLEGE GPA _____ (Assume A=4.0, B=3.0, C=2.0, D=1.0)

Honors (scholarships, fellowships, prizes, awards, honorary societies, etc.)

UNDERGRADUATE: _____

GRADUATE: _____

ADDITIONAL QUALIFICATIONS

1. Organization affiliations and offices held _____

2. List college courses taken and/or paid and volunteer work that involved: teaching and educational program development or educational evaluation methods _____

3. Extracurricular activities, high school and college _____

4. List experiences in working with groups, oral and written presentations and other leadership experiences _____

5. Describe your hobbies and other areas of special interest _____

EMPLOYMENT RECORD

List most recent or present position first; copy this form and attach extra sheets if necessary to provide additional employment data. Present employers will not be contacted until a contingent job offer is accepted by the applicant.

Employer _____ Address (street, city, state, zip code) _____ (Area Code) Telephone _____

From _____ To _____ Dates of Employment (Mo/Yr)

$ _____ Per _____ Salary (Hr/Mo/Yr)

Supervisor (name and title) _____

Your Job Title _____ Specific Duties _____

Reason for wanting to change employment _____

Employer _____ Address (street, city, state, zip code) _____ (Area Code) Telephone _____

From _____ To _____ Dates of Employment (Mo/Yr)

$ _____ Per _____ Salary (Hr/Mo/Yr)

Supervisor (name and title) _____

Your Job Title _____ Specific Duties _____

Reason for leaving _____

Employer _____ Address (street, city, state, zip code) _____ (Area Code) Telephone _____

From _____ To _____ Dates of Employment (Mo/Yr)

$ _____ Per _____ Salary (Hr/Mo/Yr)

Supervisor (name and title) _____

Your Job Title _____ Specific Duties _____

Reason for leaving _____

OTHER PERTINENT INFORMATION

1. Military Service? Yes ____ No ____ Branch _____ Active Duty _____
   From _____ (Mo/Yr) To _____ (Mo/Yr)
2. Receiving annuity under Federal Civil Service Retirement Act? Yes ____ No ____
3. Receiving any other type of Federal annuity? Yes ____ No ____
4. List any health limitations _____
5. As the job will require use of a car: Do you have a valid state license or can you get one? _____ Do you have a car or access to one? _____

STATE IN YOUR OWN HANDWRITING why you would like a position with the N. C. Agricultural Extension Service.

PROFESSIONAL REFERENCES

Please list three (3) individuals we can contact to provide a reference on your behalf. These may be former employers, supervisors, colleagues, professors, or instructors. DO NOT LIST RELATIVES OR INDIVIDUALS WHOSE ONLY RELATIONSHIP WITH YOU IS A PERSONAL ACQUAINTANCESHIP.

Name (Full)	Street or Box No.	City	State	Zip Code

AFFIRMATIONS

I have never been convicted of an offense against the law or forfeited collateral, nor am I now under charges for any offense against the law. [You may omit: (1) traffic violations; and (2) any offense committed before your twenty-first (21) birthday which was finally adjudicated in a juvenile court or under a Youth Offender law.]

Signature *Date*

I hereby certify that all information provided in this application is true, and I understand and agree that any false statement of material fact herein may cause forfeiture of all my rights to employment.

Signature *Date*

FOR OFFICE USE ONLY

Rec'd: *Ack* _____

Trans. _____

_____

Ref:

InA. _____

Exp. _____

ReA. _____

Equal Opportunity Employer
(Vacancy lists posted in each County Extension Office)

Attachment B-1
(NEW) DRAFT

INTERVIEW SUMMARY

Name of Person Interviewed (Mr. Mrs. Miss)_____

Date of Graduation_____ Home County_____

School_____ Home Address_____

Campus Address_____ _____ Zip_____

_____ Zip_____ Home Telephone ( )_____

Campus Telephone ( )_____

Major_____ Minor_____ GPA: Overall_____ Major_____

Location Preference_____

==========

I. APPEARANCE

A. Does the applicant appear clean and dressed appropriately for the interview? Yes_____ No_____

B. Does the applicant seem to be at ease in the interview? Yes_____ No_____

II. FIRST IMPRESSION--RATE WITHIN THE FIRST 5 MINUTES

_____Highly favorable first impression
_____Favorable, but not outstanding
_____I'm not impressed so far

III. ORAL EXPRESSION

A. Is the applicant's speech reasonably free from distracting mannerisms, phrases, etc.? Yes_____ No_____

B. Does the applicant hold up his/her end of the conversation? Yes_____ No_____

C. Does the applicant answer questions fully but without rambling unnecessarily? Yes_____ No_____

D. Rate the applicant's overall communication skills, considering such factors as vocabulary, grammar, and ease in expressing what he/she is trying to say:

_____Excellent
_____About average
_____Not as good as most applicants

IV. ENERGY/ENTHUSIASM LEVEL

_____Lots of energy, but well controlled
_____O.K., but doesn't stand out on this trait
_____Too much--may interfere with concentration
_____Less than normal or expected for a CEA

V. ANALYTIC SKILLS

A. Is the applicant quick to understand questions and problems? Yes_____ No_____

B. Do the applicant's responses suggest perceptive or creative thinking? Yes_____ No_____

(OVER)

VI. KNOWLEDGE

A. Rate the applicant's technical preparation

_____Excellent
_____About average
_____Barely adequate--would need considerable specialist help
_____Unacceptable for CEA positions

B. List areas of responsibility which would be strengths of this candidate.

_____

C. Weakest subject matter areas of responsibility.

_____

VII. EXPERIENCE

A. Has the applicant had work or volunteer experience that is directly related to county extension work? Yes_____ No_____ Describe _____

_____

B. Has the applicant had work or volunteer experience that will be helpful in county extension work even though not directly related? Yes_____ No_____
Describe _____

VIII. JOB AWARENESS

A. Does the applicant have knowledge of the Agricultural Extension Service, indicating preparation for the interview? Yes_____ No_____
B. Does the applicant ask questions that indicate awareness of or eagerness to learn about CEA duties? Yes_____ No_____
C. Does the applicant have career goals and educational aspirations which are compatible with CEA positions? Yes_____ No_____
D. Does applicant seem willing to accept the less desirable aspects of the job; e.g., irregular hours, reports, etc.? Yes_____ No_____

IX. FINAL IMPRESSION

_____Excellent. Hire if possible. Pursue aggressively.
_____Very good. No reservation about hiring.
_____About average. Consider only if area of specification provides a good match.
_____Not impressed with this applicant's qualifications.

Comments:_____

_____

_____

_____

_____

_____

_____

_____

Interviewer_____ Date_____

Attachment B-2
(old)

INTERVIEW SUMMARY

Name of person interviewed (Mr. Mrs. Miss) _____

School _____

Campus address _____ Zip Code _____

Home address _____ Zip Code _____

Telephone number: Home ( ) _____ County _____

Campus( ) _____

Seeking position as: _____

Major: _____ GPA: Overall _____

Minor: _____ Major _____

Location preference _____

Date of graduation _____

Area(s) of special interest _____

_____

_____

Comments of interviewer _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Interviewer _____ Date _____

Attachment B-3
(NEW)

VACANCY LISTING #_____

DEADLINE FOR APPLICATION: _____ or until a suitable candidate applies, whichever is later.

POSITION	AREA(S) OF RESPONSIBILITY	LOCATION	DATE AVAILABLE

If you wish to apply for any positions, please follow one of these procedures:

NEW CANDIDATES: Contact Dr. Michael A. Davis, Extension Personnel Development Specialist, Box 7602, Raleigh, NC 27695-7602.

APPLICANTS IN ACTIVE STATUS: Call Extension TELETIP 1-800-662-7301. Leave your name, address, and the position(s) for which you wish to apply. Or, apply in writing to the above address.

CURRENT EMPLOYEES: Contact your county or district chairman prior to writing Dr. Paul Dew, Assistant Director, County Operations.

Sincerely,

Michael A. Davis
Extension Personnel Development Specialist

-OVER-

AGRICULTURAL EXTENSION SERVICE

POSITION DESCRIPTIONS

Requirements for the available positions are listed below. Please do not apply for positions for which you are not academically or otherwise qualified.

POSITION CATEGORIES	BASIC REQUIREMENTS[1/]	GENERAL DUTIES
County Extension Chairman	Bachelor's degree in relevant field; minimum 6 years* of service with the Agricultural Extension Service, or equivalent experience; two years of experience with the N.C. Agricultural Extension Service; M.S. highly preferred. *A Master's degree may substitute for 1 year of experience and a Ph.D. for 2 years.	Provides administrative and supervisory leadership for the development, organization and implementation of an effective total Extension program in agriculture, home economics, 4-H, and community and rural development to meet the needs of the people in the county. Has program responsibility in assigned areas.
County Extension Agent, Home Economics	Bachelor's degree in Home-Economics-related concentration or Home Economics Education; M.S. preferred.	Provides leadership for the development and implementation of an effective educational program within assigned areas of home economics and related areas to meet the needs of the people in the county.
County Extension Agent, Agriculture	Bachelor's degree in Agricultural-related concentration or Agricultural Education; M.S. preferred.	Provides leadership for the development and implementation of an effective educational program within assigned areas of agricultural responsibility and related areas to meet the needs of the people in the county.
County Extension Agent, 4-H	Bachelor's degree in Agriculture or Home Economics, related Behavioral Sciences, or Education; M.S. degree preferred.	Provides leadership for the development, organization and implementation of effective 4-H programs that will meet the needs of the people in the county.

1/ All positions require: a minimum cumulative grade point average of 2.5 on a 4-point scale, or a 3.0 in the major field of study, or completion of a Master's degree; personal automobile; valid driver's license; skill in oral and written communications; interest in and ability to work effectively with people.

THE NORTH CAROLINA AGRICULTURAL EXTENSION SERVICE
PROVIDES EQUAL OPPORTUNITIES IN PROGRAMS AND EMPLOYMENT

Attachment C-2 (cont)

AGRICULTURAL EXTENSION SERVICE
NORTH CAROLINA STATE UNIVERSITY
Monthly Announcement of Vacant County Positions
June 15, 1984

Job Title	Area of Responsibility	County	Open Date	Deadline For Receiving Applications
Ext. Agent, 4-H	4-H	Gaston	06-16-84	07-15-84
Ext. Agent, Agri.	Horticulture	Orange-Chatham (will be housed in Chatham Co.)	Immediately	07-15-84
County Extension Chairman	Administration & Appropriate Subject Matter	Rutherford	09-01-84	07-15-84

The following position was advertised on the date listed but is being readvertised for applications until filled:03-15-84

County Extension Chairman	Administration & Appropriate Subject Matter	Lenoir	Immediately	---

The following position was advertised on the date listed but is being readvertised for applications until filled:02-15-84

Ext. Agent, 4-H	4-H	Rowan	Immediately	---

Persons interested in these positions should contact Dr. Michael A. Davis, Extension Personnel Development Specialist, Box 7602, Raleigh, NC 27695-7602. Current county extension employees should contact their county or district chairman prior to contacting Dr. Paul Dew, Assistant Director, County Operations.

AN EQUAL OPPORTUNITY EMPLOYER

Attachment D-1
(NEW)

AGRICULTURAL
EXTENSION
SERVICE

North Carolina State University
School of Agriculture and Life Sciences

Agricultural Extension Service
Office of the Director
Box 7602
Raleigh, N. C. 27695-7602

RE:

The above-named individual has applied for a position as a county extension agent with the North Carolina Agricultural Extension Service. Your name was given by the applicant as a reference.

We would greatly appreciate your responses to questions regarding the applicant. Hiring decisions are very important. Therefore, we appreciate your prompt reply. Your responses will be treated confidentially.

Section A:
1. How long have you known the applicant? _____
2. What has been the nature of your association? _____
3. a. If the individual was/is your employee, what position was/is held?

   _____

   b. How would you rate the individual's performance? _____

Section B: The following are skills or abilities which are important in performing the role of a county extension agent. Please rate the applicant's skills and abilities using the following scale. If you do not believe you have had sufficient opportunity to judge the particular skill/ability levels of the applicant, check the "Not Applicable" column.

	N/A	Inadequate	Not As Good As Most	Average	Better Than Most	Excellent
1. Communication skills						
2. Planning ability						
3. Develop programs and materials						
4. Knowledge of subject matter in field of study						
5. Teaching ability						
6. Recognize, analyze and solve problems						
7. Follow-through on plans and commitments						
8. Recruit, train, and utilize volunteers or resource persons						
9. Collect, analyze, and interpret data to evaluate educational effectiveness						
10. Prepare reports of plans, procedures, results						
11. Develop and maintain good public relations						
12. Seek personal and professional growth						
13. Administrative skills: supervision, office management, etc.						

Section C: Below is a list of some personal characteristics that are important in performing the role of a county extension agent. Use the same scale as before to rate the applicant.

	N/A	Inadequate	Not As Good As Most	Average	Better Than Most	Excellent
1. Honesty and integrity						
2. Work habits — punctual, budgets time						
3. Energy level — enthusiasm						
4. Innovative						
5. Initiative						
6. Sense of responsibility						
7. Judgment — appropriatness of decision						
8. Open-minded — willing to learn						
9. Accepts constructive criticism						
10. Self-confidence						
11. Tactfulness						
12. Works well with others						
13. Professionally appropriate grooming, dress and appearance						
14. Health						

Section D: 1. What particular strengths and/or weaknesses do you think the applicant would have as a county extension agent.

2. Please write additional comments that might help us in making a fair evaluation of this applicant.

Attachment D-2 (old)

AGRICULTURAL EXTENSION SERVICE

North Carolina State University
School of Agriculture and Life Sciences

Agricultural Extension Service
Office of the Director
Box 7602
Raleigh, N. C. 27695-7602

RE:

The above-named individual has applied for a position with the North Carolina Agricultural Extension Service and has given your name as a reference.

We would greatly appreciate your response to the following questions regarding the applicant. Your answers will be treated confidentially. Please feel free to add comments on the back of this page.

1. How long have you known the applicant?

2. What has been the nature of your association?

3. If the individual was your employee, what position was held?

4. Why did the individual leave your employ?

5. Would you rehire?

6. Characteristics:

	Excellent	Above Average	Average	Unknown
Loyalty to Co-workers	_____	_____	_____	_____
Honesty & Integrity	_____	_____	_____	_____
Sense of Responsibility	_____	_____	_____	_____
Personal Appearance	_____	_____	_____	_____
Initiative & Planning Ability	_____	_____	_____	_____
Intelligence	_____	_____	_____	_____
Health	_____	_____	_____	_____

Sincerely,

Michael A. Davis

Michael A. Davis
Extension Personnel Development Specialist

MAD/edm

Attachment E-1
(old)

TO : _____ Northwestern District Chairman
_____ Southwestern District Chairman
_____ Northeastern District Chairman
_____ Southeastern District Chairman
_____ North Central District Chairman
_____ Western District Chairman

FROM: Michael A. Davis
Extension Personnel Development Specialist

RE : Vacant _____ Position
County _____

The following individual has requested that he/she be considered for the above position.

Name:

Address:

Filed:

_____Application is complete

_____Application is being processed for references and transcripts

_____Application has been sent to applicant but has not been returned.

Attachment E-2
(old)

NORTH CAROLINA AGRICULTURAL EXTENSION SERVICE

AGENT EVALUATION AND PLACEMENT FORM

Applicant _____

County applied for _____

Date application received by chairman _____

Section A. (Check as appropriate)

☐ 1. Applicant considered for position but not granted an interview. (Explain reasons in B below.)

☐ 2. Applicant considered but unable to contact for an interview. (Give date and method utilized in B below.)

☐ 3. Applicant interviewed but not offered employment. (Explain reasons in B below.)

☐ 4. Applicant interviewed - employment recommended. (Give reasons in B below.)

☐ 5. Applicant interviewed - declined employment. (Give applicant's reasons in B below.)

Section B. Explanatory Comments

_____

_____

_____

_____

_____

_____

District Chairman _____

Attachment E-3 (New)

NORTH CAROLINA AGRICULTURAL EXTENSION SERVICE
POSITION PLACEMENT FORM

Position Advertised_____

Vacancy Listing_____

District_____ Chairman_____

Signature of District Chairman:

_____

Date Completed: _____

APPLICANTS	CONSIDERED NO INTERVIEW	DECLINED INTERVIEW	INTERVIEWED NOT RECOMMENDED	INTERVIEWED RECOMMENDED	RECOMMENDED NO OFFER	OFFERED EMPLOYMENT	OFFER DECLINED	HIRED	EXPLANATION

Ag & Life Sciences

AGRICULTURAL EXTENSION SERVICE

North Carolina State University
School of Agriculture and Life Sciences

Agricultural Extension Service
Office of the Director
Box 7602
Raleigh, N. C. 27695-7602

November 29, 1984

MEMORANDUM

TO : Dr. Larry Clark

FROM : Mike Davis
Mike Davis, Extension Personnel
Development Specialist

I appreciated the opportunity to meet with you to discuss the employment policies of the N. C. Agricultural Extension Service. Your offer of assistance in pursuing our Affirmative Action goals is certainly welcomed.

In particular, I would like to send a copy of our monthly position vacancy notices to key minority persons who may have contacts in the agricultural industry/education arena. As you get the time, I would appreciate receiving a listing of such persons or perhaps you can drop me a note as you come across a potential contact person.

Again, thank you for your support.

MAD/edm

SALS Today
SCHOOL OF AGRICULTURE & LIFE SCIENCES
NORTH CAROLINA STATE UNIVERSITY VOL. I NO. 2 OCTOBER 1984

Bull Testing Station Opens At New Beef Cattle Center

Butner – The first phase of the Beef Cattle Center went into operation here Sept. 7 with the opening of a bull testing station.

Within the next few years, the Center is expected to become the hub of beef cattle teaching, research and extension programs in the School of Agriculture and Life Sciences.

"I've got to let Port know that we finally have something going," quipped Dean J. E. Legates. He was referring to Dr. I. D. Porterfield, retired head of the Department of Animal Science, who Legates appointed chairman of a committee on Nov. 7, 1973 to search for land for a beef center. The search had been made necessary by the loss of about 650 acres near the campus to I-40 and the new School of Veterinary Medicine.

After several rejections, the Porterfield committee found the land it wanted in 1979. Their choice was a 1,000-acre tract in Franklin County, 23 miles from campus. But neither the 1981 nor 1983 General Assembly would provide funds to buy the land. Attention then turned to land already owned by the state at Butner.

This effort paid off when the State Farm Operations Commission notified Dean Legates last December that about 1,300 acres under its control at Butner would be turned over to NCSU. The land is located along the Granville-Durham county line about 25 miles from campus.

The bull testing station replaces the station built by a private group on leased land near Rocky Mount in 1969. It also expands the bull testing capacity in the state. The old Rocky Mount facility could accommodate 90 bulls annually; the new Butner station can handle up to 150 when completed. Only half the station has been built so far. Extension also operates bull testing stations at Salisbury and Waynesville.

Along with putting cattle on the ground at the Center this year, SALS received $1.9 million from the 1984 session of the General Assembly to begin developing the full 1,300 acres. The funding was acquired with the strong support of the N. C. Cattlemen's Association.

Dr. Charles Lassiter, head of the Department of Animal Science, said Phase I of the development program will cost about $962,000. It consists of clearing 450 acres, improving another 450 acres, building four irrigation ponds, drilling four deep wells, and constructing fences, roads, equipment sheds and corrals.

"We've also got a lot of johnsongrass to kill," he added.

Phase II of the development program calls for establishing a 400-cow herd at the center. The buildings, corrals, equipment and cattle for the herd is expected to cost about $954,000.

The 1985 General Assembly will be asked for another $2 million to carry out Phase III and IV of the development program at the center.

"As one studies the beef industry in North Carolina, it becomes clear that five factors will determine its profitability," Lassiter said. "These are successful breeding, feeding, reproduction and marketing, coupled with the management skills needed to put these practices together in beef production systems. These will be the goals of the Beef Cattle Center," he added. ■

Cattle Roam Where Soldiers Once Marched

Bulls assigned to the test station at Butner will have some infamous neighbors. An example is John Hinckley, the man who shot President Reagan. Hinckley was incarcerated at the nearby Federal Correction Institution.

Actually, Butner is the home of several public facilities. They are located on land – over 40,000 acres – acquired by the federal government during World War II for an infantry training base. Most of the land was returned to private ownership after the war, but a sizeable tract remains in government hands. The federal prison has about 800 acres. The N. C. National Guard has about 5,000. The N. C. Department of Human Resources has about 2,000 on which John B. Umstead Hospital and Murdock Center are located. Another 5,000 acres, now

Randall W. (Randy) Guthrie

minus the 1,300 transferred to NCSU, are used by the N. C. Department of Agriculture to produce food for the state institutions.

Randall W. (Randy) Guthrie, 35, extension specialist in charge of the bull testing station, was assistant manager of the NCDA farming operation at Butner prior to joining Extension on May 7. He held the position for 12 years, during which time he was responsible for beef, dairy, swine and egg production.

Guthrie is a native of Roanoke Rapids and a 1972 animal science graduate of NCSU. ■

Woman Farmer First To Use Test Station

BUTNER – "I live only 15 minutes away," said Beverly Smith, explaining why she was first in line at the new Bull Testing Station here.

The date was Sept. 7 and the time was 8:30 a.m. The new Bull Testing Station was ready for business and Mrs. Smith was anxious to get her Angus bull checked in early.

"I need to get back home and bale alfalfa," she said, glancing up at an azure sky.

Mrs. Smith was the first farmer to use the first facility to be constructed at NCSU's Beef Cattle Center. Arriving soon after her 10-month-old Angus were three Polled Herefords belonging to Joe Powell of Tarboro and Logue Corbert of Macclesfield. They were soon joined by more Herefords belonging to Stewart Ledford of

Mrs. Smith delivers her bull to Extension Specialist McGraw.

Cooleemee. Before the day was out, the station was populated by 27 Angus, 17 Polled Herefords, 16 Simmentals, 5 Charolais, and 1 Gelbvieh. Each bull was tagged, weighed, measured, assigned to a pen according to breed, and started on a standard corn silage-based ration.

(Continued on page 8)

Cook Assumes Administrative Duties in ARS

Dr. Robert E. Cook will be promoted to assistant director of the North Carolina Agricultural Research Service as soon as a successor for him can be found in the Department of Poultry Science.

Cook has headed the Department of Poultry Science since 1969. A search committee, chaired by Dr. David Lineback, head of the Department of Food Science, hopes to have recommendations for the position by the end of October.

Dr. Durward F. Bateman, director of the Agricultural Research Service, said he was extremely pleased to have a person with Cook's experience and capability join his administrative staff. He will be responsible for programs related to animal agriculture, Bateman said. He will also work with several commodity organizations and serve as liaison with a number of departments in SALS, including several in the biological sciences. In addition, Cook will spend about 25% of his time working with the Cooperative State Research Service (CSRS) of the USDA. In this capacity, he will help CSRS administer poultry science research throughout the state agricultural experiment station system.

Dr. J. E. Legates, dean of the School of Agriculture and Life Sciences, said, "Dr. Cook has given outstanding leadership to our Department of Poultry Science during a period of unprecedented growth for our state's poultry industry.

Dr. Robert E. Cook

The department currently accounts for about 25% of the B.S. graduates in poultry science in the country. It is also a national leader in research related to reproductive physiology, microtoxins and nutrition.

Cook leaves the department at a pivotal point in the state's agricultural history. Poultry is running neck and neck with tobacco as the leading source of gross farm income. Both commodities are bringing in about $1 billion each, but most observers believe that poultry will pull ahead of tobacco within the next year or two.

"North Carolina has a well-rounded poultry industry," Cook said. "We are No. 1 in turkeys, No. 1 or 2 in broiler breeders (hatching eggs), No. 4 in broilers, No. 5 in commercial eggs, and emerging in ducks and game birds."■

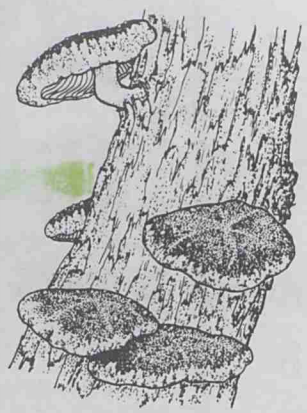
SALS Receives New Monies

After several years of slim pickings because of the recession, the 1984 session of the General Assembly funded several projects of importance to SALS.

The biggest of these was the $1.9 million appropriation for the development of the beef center at Butner. (See page 1) The second largest amount was $360,000 for research and extension facilities at the Mountain Horticultural Crops Research Station, Fletcher. An office was approved for the Sandhills Research Station, Jackson Springs, at a cost of $75,000. Some $60,000 was provided for an area extension swine position in Southeastern North Carolina. Other items included a turfgrass research laboratory, $50,000; corn research and extension, $40,000; and turfgrass research and extension, $30,000.

The most unique appropriation was $25,000 for the Agricultural Extension Service to explore and demonstrate the potential for forest mushroom production in Western North Carolina. Japan currently exports about $10 million worth of their famous Shiitake (forest) mushrooms to the United States each year. Some people believe these mushrooms could be grown in Western North Carolina as a supplemental source of income.

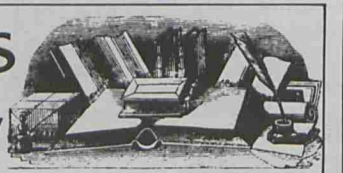
In addition to the appropriations that came to NCSU, the General Assembly appropriated money for four branch research stations owned by the N. C. Department of Agriculture. Included were $220,000 for irrigation facilities for the Peanut Belt Research Station, Lewiston; $200,000 for sweet potato facilities at the Horticultural Crops Research Station, Clinton; $145,000 for beef and sheep facilities at the Mountain Research Station, Waynesville; and $100,000 for poultry facilities at the Piedmont Research Station, Salisbury.



Shiitake mushrooms
Illustration by Anne Marshall Runyon

"These appropriations will benefit us too," said Dr. Durward Bateman, director of the N. C. Agricultural Research Service. Parts of the branch research stations are owned by NCSU and part by NCDA. Scientists with NCARS are responsible for the research at all stations, however.■

Highlights in History



By Bill Carpenter

A service program, in contrast to the traditional educational role of the Extension Service, came with the mattress making program that began in March, 1940, and ran for two years.

For many farm families, this anti-poverty– surplus crop disposal program provided the first good bed they had ever slept on.

By May, 1940, the program was underway with 4,600 bales of cotton from government warehouses allocated to North Carolina. Nearly 40,000 mattresses had been completed by the end of 1940. When the program ended in 1942, more than 220,000 mattresses had been made.

Added to the program in 1941 was the making of comforters. When this program ended, also in 1942, some 100,000 had been made.

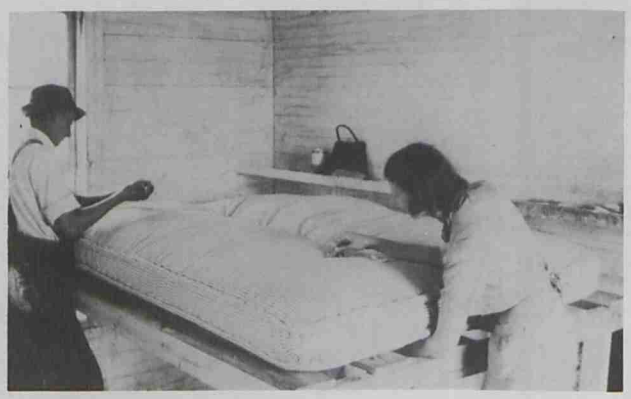
Two government agencies were responsible for the program--the Extension Service and the Federal Agricultural Adjustment Administration (Triple A).

County extension agents located a suitable building, which included storage space for the bales of cotton and work area. Each mattress contained 50 pounds of cotton and 10 yards of 32-inch ticking. A county agent or program aide supervised the program in each county.

State Extension Specialists Pauline Gordon, Mamie Whisnant, Willie Hunter, and Eugene Starnes trained the county personnel.

At the beginning of the program families with an annual income of less than $400 were eligible. Later the requirement was raised to $600. Only cost to the participating families was a small charge for the cost of needles, thread, and incidental expenses of the local mattress making center.

For most of the families it was the first mattress they had ever owned. The cotton mattresses were not only more comfortable than the traditional bed tick filled with wheat straw or other homegrown material; they were more convenient, better looking, and a definite source of pride.



Farm couple sews ticking on cotton-filled mattress.

Lorna Langley, home economics agent in Sampson County at that time, recently recalled visiting a home that had made their third mattress (maximum number under the program) with Mamie Whisnant to see what the family was doing with them.

"We went into this lady's home and she had three mattresses, one on top of the other piled on a bedstead. The children were sleeping on the floor. Of course, we raised the question why these three were stacked up and the children were sleeping on the floor? She said, "Well, I will tell you, me and my old man slept on one one night and it felt so good that we decided we would put all of them on here. We are going to take it apart after a while and let the children sleep on them."

In addition to the purely service aspect of conducting the mattress program, both specialists and agents figured out ways to incorporate educational messages on sewing, bedding, and other house furnishing ideas.

(Editor's note: "Highlights in History" is drawn from a history that Dr. Carpenter is completing on the School of Agriculture and Life Sciences.)■

Swaisgood and Skaggs Become Newest Reynolds Professors

DR. Wayne Skaggs, professor of biological and agricultural engineering and soil science, and Dr. Harold E. Swaisgood, professor of food science and biochemistry, are the newest William Neal Reynolds Professors.

Their selection was formally announced at a luncheon in their honor on Sept. 4. The title was effective July 1. They are the 32nd and 33rd Reynolds Professors named since the late William Neal Reynolds established the endowment in 1950 which supports the professorships.

"Colleagues find working with Wayne Skaggs a rewarding experience," said Dr. F. J. Hassler, head of the Department of Biological and Agricultural Engineering. Hassler then outlined for luncheon guests Skaggs' contributions to teaching, research and public service.

Skaggs has pioneered in theoretical relationships and laboratory techniques for predicting water movement in complex soils. Based on these fundamental results, he has defined the parameters and developed design methods for unified drainage-sub-irrigation systems. One result has been DRAINMOD. This is a computer model developed by Skaggs for tailoring the design of drainage and sub-irrigation systems to specific soil, site and climatological conditions. DRAINMOD has been fully implemented on the national computers of the Soil Conservation Service and can be accessed from every SCS state office.

Swaisgood's Work

"Harold embodies all the qualities one expects in named professors," Dr. David Lineback, head of the Department of Food Science, said of Swaisgood. "He is a respected scientist and beyond that a fine human being. He operates as a team member...someone who shares willingly with colleagues...is extremely productive...knows how to keep his program focused and avoids getting sidetracked," Lineback added.

Swaisgood began his research isolating and determining the physiochemical characteristics of milk proteins. He became a pioneer in basic research on enzyme identification, structure, kinetics, immobilization and stabilization.

George Wise (center), an original Reynolds Professor named in 1951, was present to greet the newest professors, Swaisgood (left) and Skaggs. Photo by Vellie Matthews

Acclaimed as a basic researcher, Dr. Swaisgood has been able to use concepts developed in his research to solve food industry problems. A penicillin test kit, which he developed, is being marketed to detect trace amounts of antibiotics in farm milk. His elucidation of the molecular basis for cooked flavor in UHT (ultra-high temperature) milk, coupled with his sulfhydryl oxidase patents, are being used to develop an immobilized enzyme reactor for removing cooked flavor.

Skaggs was born Aug. 20, 1942 in Grayson, Ky. His B. S. and M. S. degrees are in agricultural engineering from the University of Kentucky. His Ph. D., also in agricultural engineering, is from Purdue University. He has been on the NCSU faculty since 1970.

Swaisgood was born Jan. 19, 1936, in Polk, Ohio. His B. S. is in dairy technology from Ohio State University and his Ph. D. is in chemistry from Michigan State University. He has also done postdoctoral work at the USDA Eastern Regional Research Laboratory. He has been on the NCSU faculty since 1972.■

William Neal Reynolds

Reynolds Aided Numerous Causes

William Neal Reynolds was a businessman, philanthropist and harness racing enthusiast.

He was born in Virginia in 1863, 12 years before his older brother, Richard J. Reynolds, started a tobacco company in Winston-Salem. William Neal joined in the company in 1883 and remained with it for 60 years. His positions with R. J. Reynolds Tobacco Company included those of vice president, president, chairman of the board and chairman of the executive committee.

At the time of his death on Sept. 10, 1951, his stables contained the world's top two pacers. He also had a long list of philanthropies to his credit. Only one – $800,000 toward the establishment of a new library in Winston-Salem – exceeded the $340,000 endowment for the William Neal Reynolds Professorships.

Rain Leads to Reynolds Gifts

It was truly a million dollar rain which fell on North Carolina in June 1940. Some 5,000 people were packed onto the campus of N. C. State College for annual Farmer's Week. Meetings scheduled for the only adequate place on campus – Riddick Stadium – were rained out for two days.

The dilemma gave David Clark of Charlotte (Class of '94) an idea. Why not build an indoor stadium where rain or shine 10,000 farmers could get together to solve their problems. He envisioned a building big enough to accommodate all kinds of agricultural exhibits, farm demonstrations, machinery displays, industrial exhibits, an armory for the ROTC, an auditorium for religious meetings, opera, symphony concerts, and an arena for horse shows, cattle shows and sports events.

Some 10 years, three governors, four general assemblies, four budget commissions, two budget directors and two Babcocks later, N. C. State University dedicated William Neal Reynolds Coliseum.

The Babcocks were Mary Reynolds Babcock, daughter of R. J. Reynolds, and her husband Charles. Mrs. Babcock contributed $100,000 towards construction of the coliseum at a critical point and the decision was made to name it in honor of her beloved Uncle Will. (He later named one of his greatest harness horses for her.)

Based on Depression-era estimates, Mrs. Reynolds' gift was to cover a third of the cost. The actual cost came to about $2.5 million by the time the Coliseum was completed after World War II.

NCSU Vice Chancellor Rudolph Pate recalls that "Uncle Will" visited the coliseum shortly before his death in 1951 at the age of 88. Among other things, he wanted to know how much money the Reynolds family had contributed to the structure. He was told that Mrs. Babcock contributed $100,000 initially and tossed in another $52,000 later for an ice rink. He seemed genuinely embarrassed, Pate recalls, that such a costly building would be named in his honor when his family had made such a paltry contribution.

As a result, he invited university officials "to submit to him a proposal for a project that 'will mean more to State College than this building'." **(Continued on page 7)**

William Neal Reynolds Distinguished Professors

C. C. Cockerham, statistics and genetics;
W. E. Donaldson, poultry science;
F. J. Hassler, biological and agricultural engineering;
C. H. Hill, poultry science and animal science;
Ernest Hodgson, entomology;
H. R. Horton, biochemistry;
W. A. Jackson, soil science;
E. J. Kamprath, soil science;
J. G. Lecce, animal science and microbiology;
C. S. Levings, III, genetics;
J. E. Legates, animal science and genetics;
R. W. Skaggs, biological and agricultural engineering and soil science;
H. E. Swaisgood, food science and biochemistry; and
S. B. Tove, biochemistry and animal science.

Emeriti

D. U. Gerstel, crop science and genetics;
W. C. Gregory, crop science and genetics;
P. H. Harvey, crop science;
C. J. Nusbaum, plant pathology;
R. L. Rabb, entomology;
M. L. Speck, food science and microbiology;
S. G. Stephens, genetics;
L. C. Ulberg, animal science;
J. A. Weybrew, crop science; and
G. H. Wise, animal science.

Deceased

N. T. Coleman, soil science;
C. H. Hamilton, sociology and anthropology;
H. L. Lucas Jr., statistics;
Gennard Matrone, biochemistry and animal science;
Z. P. Metcalf, entomology; and
W. J. Peterson, chemistry and dean of the graduate school.

Resigned

C. E. Bishop, president, University of Houston;
J. H. Jensen, president emeritus, Oregon State University; and
Arthur Kelman, chairman emeritus, Department of Plant Pathology, University of Wisconsin.

Focus on People

Best Wishes

Dr. James B. (Jim) Evans, who steps down Dec. 31 as head of the Department of Microbiology. He will then assume a part-time position for the next months to do some teaching and research, and "to help ease the transition for my successor." Evans has headed the Department of Microbiology since its creation on July 1, 1965. During his tenure, the department has awarded 67 doctorates and 141 master of science degrees. It also offers undergraduates an option in the biological science curriculum. Among the areas of research in which the department excels are microbial physiology, metabolism and genetics. Evans joined the NCSU faculty in 1960 after 11 years on the faculty of the University of Chicago.

Dr. James B. Evans

Dr. W. L. (Bill) Carpenter, who retires Dec. 31 after 33 years with the Department of Agricultural Communications. A proponent of "letting the people know," Carpenter headed the department from 1959 to 1980. Most of his other time has been spent as publications editor and on special writing assignments. One of his latest contributions is a comprehensive history of the School of Agriculture and Life Sciences, which will be published shortly. He plans to retire to his home farm near Lincolnton.

Dr. W. L. Carpenter

Carmen Marin, who retired Sept. 30 after 23 years as head of the Tobacco Literature Service. This office, located in the D. H. Hill Library, is the major international indexing and abstracting service for scientific articles and books on tobacco. Its monthly publication, "Tobacco Abstracts," has a worldwide circulation of about 700. A native of Spain, Marin holds the Comendator of the Spanish Civil Order of Agricultural Merit. It was awarded in 1981 by King Juan Carlos I. "Carmen has provided a very important service to the people who work in tobacco," said Dr. I. T. Littleton, director of the library.

R. L. (Robbie) Robertson, who retired Sept. 1 as an extension entomology specialist after 23 years on the faculty. A past president of the N. C. Entomological Society, he has taken a position as the first executive-secretary of the Turfgrass Council of North Carolina. Other recent Extension retirees include **Carolyn Alligood,** Beaufort County home economics agent; **Warren G. Barnes,** Craven County agricultural agent; **Mollye Briley,** Robeson County home economics agent; and **Eugenia Ware,** Rutherford County extension chairman.

Welcome

Jeffrey F. Carpenter, Swain County assistant agricultural extension agent, 4-H, effective July 16; B.S., animal science, NCSU, 1983.

Christopher P. Carson, extension specialist, biological and agricultural engineering, effective June 1; B.S., agricultural economics, NCSU, 1981; computer operator, Tipper Tie, Apex, 1983-84.

John S. Clay, extension specialist, dairy records, effective Aug. 1; B.S., 1975, and M.S., 1978, dairy science, VPI&SU; computer programmer, VPI&SU, 1978-84.

Dr. Maurice G. Cook, who returned to the campus Sept. 1 after a two-year leave during which he served as director, Division of Soil and Water Conservation, N. C. Department of Natural Resources and Community Development. An NCSU faculty member since 1961, he had served previously as teaching coordinator in the Department of Soil Science. He has now assumed an extension position with responsibilities for soil conservation education and non-farm uses of land.

Kevin S. Fisher, Rowan County assistant agricultural extension agent, effective Aug. 1; B.S., 1980, and M. Ed., 1982, agricultural education, NCSU; voag teacher Durham and Alexander counties, 1980-84.

Dr. Stephen A. Hatchett, assistant professor, economics and business, effective Aug. 1; B.S., forestry, University of California, Berkeley, 1977; M.A., business, University of California, Riverside, 1980; Ph.D., agricultural economics, University of California, Davis, 1984.

Philip A. Hight, Washington County assistant agricultural extension agent, effective Aug. 1; B.S., agricultural education, NCSU, 1983; employed in marketing by Plymouth Fertilizer Co., 1983-84.

Alice K. Grunwald, Rowan County assistant extension agent, 4-H, effective Sept. 1; B.A., home economics, Berea College, 1984.

John B. Hall, Davie County assistant agricultural extension agent, effective Aug. 1; B.S., 1982, and M.S., 1984, animal science, University of Georgia.

Dr. Dana L. Hoag, assistant professor, economics and business, effective Oct.1; B.S., farm and ranch management, Colorado State University, 1980; M.S., agricultural economics, Colorado State University 1981; and Ph.D., agricultural economics, Washington State University, 1984.

Alicia L. Lanier, extension specialist, biological and agricultural engineering, effective, Aug. 7; B.S., biological and agricultural engineering, NCSU, 1984.

Janice H. Lloyd, extension family resource management specialist, effective July 16; B.S., home economics, Penn State, 1955; M.Ed., home economics education, University of Missouri, 1976; associate director, Michigan Consumer Education Center, 1979-83.

Paul A. McDaniel, instructor, soil science, effective Aug. 16; B.S., biology, University of Kentucky, 1975; M.S., soil science, Montana State University, 1983.

Carl R. McKnight, Davidson County assistant agricultural extension agent, effective Aug. 1; B.S., 1981, and M.S., 1983, animal science, NCSU.

Dr. David M. Miller, III, assistant professor, zoology, effective Aug. 16; B.S.; biology, University of Southern Mississippi, 1973; and Ph.D., biochemistry, Rice University, 1981; research associate, Baylor College of Medicine, 1982-84.

Dr. Richard L. Noble, professor, zoology, effective July 1; B.S., 1963, and M.S., 1964, fisheries biology, Iowa State University; and Ph.D., fisheries biology, Cornell University, 1968; associate professor, 1975-81, and professor, 1981-84, Texas A&M University.

Nancy Painter, Watauga County assistant extension agent, 4-H, effective July 16; B.S., home economics, 1980, and M.S., early childhood education, 1983, Tennessee Technological University.

Susan Scott, Alleghany County assistant extension agent, 4-H, effective July 16; B.S., 1982, M.S., 1983, home economics, Western Carolina University.

David S. Slater, Randolph County assistant agricultural extension agent, effective Sept. 1; B.A., humanities, Wofford Collge, 1976; B.S., agronomy, University of Minnesota, 1982; M.S., crop science, NCSU, 1984.

Eric V. Spaulding, Johnston County assistant agricultural extension agent, effective July 1; B.S., agricultural education, A&T State University.

Jean Spooner, extension specialist, biological and agricultural engineering, effective July 16; B.S., agronomy, Cornell University, 1976; M.S., soil science, NCSU, 1980; and M.S., statistics, Utah State University, 1982; senior statistician, Morton Thiokol Corp., Brigham City, Utah, 1981-84.

Dr. Walter N. Thurman, assistant professor, economics and business, effective July 1; B.S., environmental studies, Utah State University, 1976; M.S., economics, Montana State University, 1977; M.A., economics, University of Chicago, 1980; Ph.D., economics, University of Chicago, 1983.

Morris B. Warner, Vance County assistant agricultural extension agent, effective Sept. 1; B.S., agronomy, 1980, and M.Ag., animal science 1982, Clemson University; employed Idlewild Research Station, Louisiana State University, 1982-84.

Dr. Kathleen M. Williams, assistant professor, horticultural science, effective Oct. 22; B.A., history, University of California, Santa Barbara, 1972; and M.S., 1979, and Ph.D., 1984, pomology, Cornell University.

Dr. Kelly D. Zering, assistant professor, economics and business, effective April 4; B.S.A., agricultural economics, University of Manitoba, 1977; M.S., agricultural economics, University of Manitoba, 1980; and Ph.D., agricultural economics, University of California, Davis, 1984.

Congratulations

John Hamby of Durham, who has been elected chairman of the Advisory Council for the School of Agriculture and Life Sciences. Hamby is vice president of FCX, Inc. He is also a past president of the N. C. Poultry Federation, N. C. Egg Marketing Assn. and the North American Poultry Cooperative. Elected vice chairman of the Council was **Ray M. Spencer,** Scranton, Rt. 1, a past president of the N. C. Soybean Producers Assn. Elected to serve with Hamby and Spencer on the Council Executive Committee were **John Hendricks,** Shelby, Rt. 5, immediate past president of the National Turkey Federation; **J. Nelson Gibson Jr.,** Gibson, a past president of the N. C. Cotton Promotion Assn., and Col. (USAF-Ret) **William H. Breeze,** Rougemont, cattleman and supervisor of the Orange Soil and Water Conservation District. Dean J. E. Legates appoints representatives to the 26-member council, which counsels the SALS administration on teaching, research and extension programs and helps to secure resources to implement those programs. Council members elect their own officers and executive committee.

John Hamby

John C. Blair, who was appointed Clay County extension chairman, Sept. 15. He succeeded **J. B. Reeves,** who resigned from Extension to manage the livestock market in Cherokee. Blair had been serving as an area extension agent in five western counties.

Dr. Pedro A. Sanchez, professor of soil science and coordinator of the Tropical Soils Research Program, who received the Order de Merito Agricola with the rank of Caballero from the government of Peru. The award, which is seldom made to non-Peruvians, marked the completion of Sanchez' services as chief of the NCSU Mission to Peru.

J. D. (Jerry) Shiffert, manager, agricultural programs, R. J. Reynolds Tobacco Co., who received the 1984 Outstanding Service to Agriculture Award from the N. C. Association of County Agricultural Exension Agents. Reynolds support for research and extension work at land-grant universities has increased fivefold since Shiffert assumed his position. Extension Agents say this support has helped them to do a better job of serving tobacco farmers.

Dr. J. C. Raulston, professor of horticulture, who received the L. M. Ware Distinguished Teaching Award from the American Society for Horticultural Science. He is "an oustanding example of what teaching is all about – relaying solid, technical information in a motivating and humanizing manner," the citation to Raulston stated.

Dr. James E. (Jim) Shelton, associate professor and extension specialist, soil science, Mountain Horticultural Crops Research Station, Fletcher, who received the Superior Service Award of the Tennesse Valley Association. His soil fertility work, especially as it relates to Christmas trees, tomatoes and apples has had an impact throughout the Valley, the citation to him stated.

John Hendrick of Shelby, who will get to present President Reagan with his Thanksgiving turkey. He will do this in his capacity as president of the National Turkey Federation and as a representative of the nation's No. 1 turkey-producing state. Hendrick is also the immediate past chairman of the SALS Advisory Council.

Five faculty members who are recipients this year of Outstanding Extension Service Awards given by NCSU Division of Continuing Education. They are **Dr. Harriet Tutterow Jennings,** clothing specialist; **Dr. Frank Thomas,** food (seafood) science specialist; **Dr. Maurice Voland,** specialist-in-charge of sociology; **Dr. Gary San Julian,** wildlife specialist; and **Dr. John Van Duyn,** entomology specialist stationed at the Tidewater Research Station, Plymouth.

Wayne Mabry, an Albemarle attorney, who is serving as chairman of the 20-member State Advisory Council of the N. C. Agricultural Extension Service. Said Mabry, ". . .Extension is right up front. . .doing a super job. This view has been reinforced by meeting Extension personnel from throughout the state and seeing their professionalism." Serving as vice chairman of the council is **LuAnn Whitaker,** a Washington homemaker and youth leader. The treasurer is **Juanita Hudson,** Benson, Rt. 1, a past president of the N. C. Extension Homemakers Assn.

Dr. Henry D. Bowen, professor of biological and agricultural engineering, who received the 1984 John Deere Gold Medal Award from the American Society of Agricultural Engineers (ASAE). He was cited for his identification of basic factors affecting seed germination and plant growth and incorporating these factors in improved planting and tillage methods.

Dr. Tyre C. Lanier, associate professor, food science, who is the recipient of the 1984 Earl P. McFee Award of the Atlantic Fisheries Technological Conference (AFTC). He was cited for his research related to surimi (water-washed minced fish) and its application to new seafood uses.

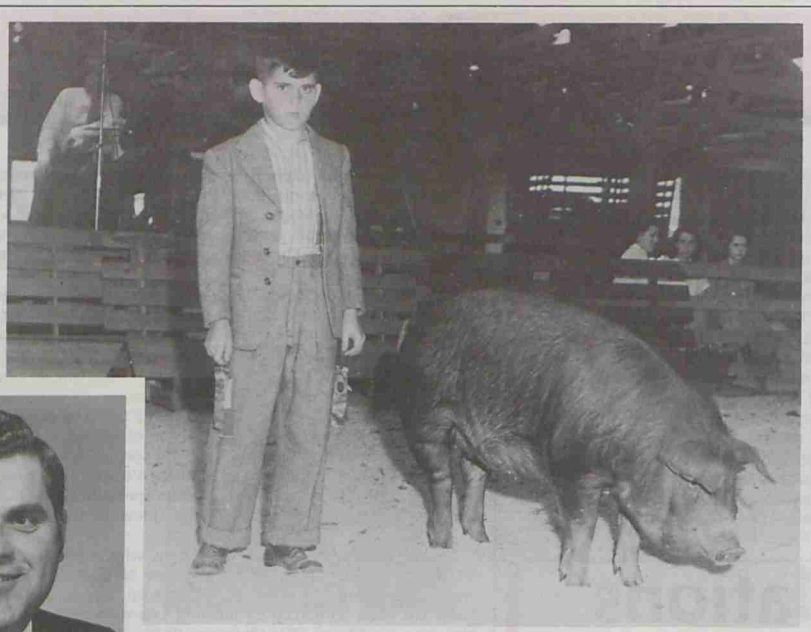
Mrs. Winnie Wood, a Camden County farm woman, who is serving this year as chairman of State Farm-City Week. At her suggestion, the N. C. Agricultural Extension Service has a search underway for the outstanding farm woman in each county and for the state. **Dr. Kenneth N. May,** vice president of Holly Farms Poultry Industries, Inc., Wilkesboro, is state vice chairman of Farm-City Week, which is the week immediately preceeding Thanksgiving Day.

Agricultural engineers who won two of the nine Paper Awards presented this year by the American Society of Agricultural Engineers (ASAE). **F. F. Lee,** a graduate student, and **Dr. Roger P. Rohrbach,** professor of biological and agricultural engineering, won an award with their paper "Firmness Modeling and Rapid Relaxation Modulus Determination in Blueberries." The second paper selected was "Energy and Water Requirements for Subirrigation vs. Sprinkler Irrigation." It was written by **F. C. Massey,** graduate student; **R. W. Skaggs,** Reynolds professor of biological and agricultural engineering; and **Ronald E. Sneed,** extension specialist. The ASAE screened 370 papers in choosing nine for recognition.

Dr. Todd R. Klaenhammer, professor of food science, who received the 1984 Pfizer Award in Cheese and Cultured Products Research at the 79th meeting of the American Dairy Science Assn.

Ronald N. Day, who set a new wheat production record for the Southeast by topping 114 bushels on an acre in Person County. He credits part of his success to the on-farm tests conducted by the Extension Service. "They give me a lot of good ideas," he said of the tests.

The **Department of Poultry Science,** which received the Southern Award for Excellence in agricultural technology instruction. The award was sponsored by the National Association of State Departments of Agriculture and R. J. Reynolds Industries, Inc.



Dalton Proctor's 4-H career got off to a good start when, at the age of 10, he entered the top Duroc gilt in the regional 4-H livestock show in Kinston.

Dr. Dalton R. Proctor

4-H Helped to Shape Dalton Proctor's Life

Dalton Proctor's career has taken several twists and turns. But at every turn, when given the choice, he has chosen 4-H.

The latest turn in his career came Sept. 1 when he became assistant director of the North Carolina Agricultural Extension Service and state 4-H leader.

The promotion was the culmination of a love affair with 4-H that began 40 years ago as a 10-year-old farm boy with a calf on a Wilson County farm.

"My love of and belief in 4-H is a part of my value system and has guided my career choices throughout my professional life," he said.

Over the years, Proctor had the opportunity to become an extension livestock agent, county extension chairman or continue as a community development specialist. Each time, he chose to stay with or rejoin 4-H.

Along with providing skills and leadership training, Proctor said 4-H gave him an opportunity to observe professionals as role models. "As a boy of 13 or 14, I remember Lyman Dixon (retired 4-H specialist) working with our 4-H livestock shows and sales. I said to myself at the time, 'I would like to be like him'. Some 31 years later, Proctor assumed the position once held by Dixon.

Other professionals who left their mark on Proctor include Jim Butler, extension livestock specialist; E. R. Barrick, retired professor of animal science; and the late Earl Hosteller, another professor of animal science. His only son, Anthony, is named after the late J. O. Anthony, the Wilson County agent during Proctor's youth.

"Extension was a way of life for us," Proctor said of his family, which included two brothers and a sister in addition to his father, Jesse, and mother, Pauline. Their skill in growing tobacco, corn, soybeans and swine earned them a "Master Farm Family Award" in 1954. His parents still live in the Saratoga Community.

4-H Goals

As the new state 4-H leader, Dr. Proctor hopes to see the involvement of the maximum number of youth in 4-H. Participation is currently around 100,000. One goal is to boost this number by 20,000.

The purpose of 4-H, he says, is to help young people develop life skills in a learn-by-doing environment. A strength of the program is its "university knowledge base," and one of his goals is to build a stronger partnership with the subject matter departments at NCSU. He is also proud of the 17,000 people across North Carolina who volunteer their time to help Extension with 4-H. Another asset, he said, is the many donors who contribute money, awards and occasionally time to 4-H.

"There is no doubt in my mind that we must seek more private support for 4-H," he said. "We can't depend as heavily as we have in the past on public funds and still have a top quality program."

Proctor would also like to tap more of the non-money resources of private organizations. He cites as an example the recent science and technology camp at Betsy-Jeff Penn 4-H Center. "We were able to get some outstanding teachers from industry for the camp," he said.

Predecessors in Position

Proctor succeeds Dr. Donald L. Stormer in the state 4-H leader position. Stormer resigned last April to become deputy administrator, 4-H - youth, Extension Service USDA. This makes him the national 4-H leader.

Proctor is only the fifth person to hold the state 4-H leader title. The first was L. R. Harrill, who held the position from 1926 to 1963. He was succeeded by T. Carlton Blalock, 1964-70; Chester D. Black, 1970-75; and Stormer, 1976-84.

Several earlier Extension leaders had responsibility for parts of the youth program. These included I. O. Schaub, who began Boys' Club work in 1909, and T. E. Browne, who succeeded him in 1912. Jane S. McKimmon assumed responsibility for the Girls' Canning Clubs in 1911 and John D. Wray was appointed to work with black 4-H boys in 1915.

Proctor at Glance

Personal history: Born Jan. 1, 1934, Wilson; married to the former Ruby Hines; two children, Pam, 23, and Andy, 15; education: B. S., animal science, NCSU, 1956; M. Ed., adult education, NCSU, 1968; and D. Ed., VPI&SU, adult education, 1974.

Professional experience: extension agent, Caswell and Greene counties, 1958-69; community development specialist, 1969-74; state 4-H specialist, 1974-75; associate state 4-H leader and specialist-in-charge, 1975-84. He also served as acting state 4-H leader from January to June of 1976.■

Poulton Praises Way Farm Groups Work Together

Chancellor Bruce R. Poulton

By Woody Upchurch

Lewiston – N.C. State University Chancellor Bruce R. Poulton praised the cooperation within North Carolina agriculture in remarks at the annual Peanut Field Day here on Sept. 6.

He contrasted the cooperation which exists here with lack of cooperation in Maine, where he once served as dean of agriculture and where he and Mrs. Poulton had just recently returned from vacation.

While vacationing in Maine, he saw a large building constructed for agricultural purposes now housing a business forms establishment. Another farm building, a former broiler house, had been converted to non-farm use.

Poulton said he learned of the hard times that had befallen the once proud Maine potato industry. A strong dairy industry has weakened to the point that milk has to be imported into the state.

The Maine agricultural industry is in serious trouble, he told. N. C. peanut farmers, because the infrastructure that supported once strong potato and broiler industries has weakened.

This has happened, the Chancellor suggested, because the different segments of agriculture in Maine no longer cooperate.

"One of the things that North Carolina has," Poulton said, "is a wonderful spirit of cooperation and mutual support among the various segments of its agriculture."

He emphasized the importance of continued cooperation for the future good health of the state's agriculture. "The key to the future is research," he said, "but not unless that research is on target and gets to the people such as yourself." Free flowing communication and a spirit of working together will help to assure this, he added.

Among those appearing on the field day program with Poulton were Dr. J. E. Legates, dean of the School of Agriculture and Life Sciences; and Dr. Durward Bateman, director of the N.C. Agricultural Research Service.■

New Scholarships Aid SALS Students

Marvin McClam

Students in the School of Agriculture and Life Sciences are the beneficiaries of five new scholarship programs unveiled in recent months.

FCX, Inc., has established a $5,000 endowment in the NCSU Agricultural Foundation in honor of Marvin McClam. The endowment recognizes McClam's 36 years of "unselfish, loyal and dedicated service," according to the agreement signed by FCX and NCSU.

Income from the endowment will permit the awarding of one $500 scholarship each year.

McClam began his career with FCX as a manager trainee in 1948. He rose to the position of president and general manager from which he retired June 30, 1984.

"FCX has been a strong, positive force in the state's agricultural development, and this endowment will assist in attracting and training future agricultural leaders," Dean J. E. Legates said.

Turf Support

The Carolinas Golf Association has established five $1,000 scholarships for students majoring in turfgrass management. The purpose of the scholarships is to encourage students to take full advantage of the opportunities offered by NCSU to prepare themselves for successful careers in turfgrass management and other careers related to golf. SALS offers a B. S. degree in agronomy with a turfgrass management option. It also offers an associate degree in turfgrass management in the Agricultural Institute. North Carolina has about 800,000 acres in turf. This includes land in home lawns, roadsides, parks, industrial sites and cemeteries as well as golf courses. Representing the association at the luncheon on Sept. 14, at which the scholarship program was announced, were Dan W. Hill III of Durham, president; Hale Van Hoy of Clemmons, executive director; Charles E. Lynch of High Point, general counselor; Dr. Carl Blake of Raleigh, agronomist; and Ross Fowler, superintendent of the Hope Valley Country Club, Durham.

Barnes Scholarship

First Colony Farms, Inc., of Creswell has established a $6,000 scholarship endowment in the N. C. 4-H Development Fund. Income from the endowment will be used to award an annual scholarship to a 4-H member from Northeastern North Carolina in memory of Kristine Barnes.

Miss Barnes was killed earlier this year in an automobile accident at the age of 16. She was the daughter of Mr. and Mrs. Stephen Barnes. Mr. Barnes (Steve) is a NCSU graduate who was employed as an extension specialist at the Tidewater Research Station, Plymouth, from 1965-74. He is now employed by First Colony Farms.

First Colony also contributed $500 so the first scholarship could be awarded for the 1984-85 school year. It was presented to Garry Copeland, Rt. 1, Tyner. Copeland is a freshman, majoring in zoology.

Kilgore Endowment

The descendants of the late Benjamin Wesley Kilgore, SALS' first dean, have established a food science scholarship endowment in his honor.

The endowment was announced at a luncheon on Sept. 10 attended by Kilgore's son, James D. Kilgore, and eight other members of the Kilgore family. Included were a grandson, Ben Kilgore III, and a great grandson, Ben Kilgore IV.

Descendants of Benjamin Wesley Kilgore (portrait) present for the announcement of the scholarship program included a son, James D. Kilgore; a daughter-in-law, Mrs. Violet Kilgore Tilley; and the husband of a great granddaughter, John Wiley.

The family announced that the endowment would be funded initially at $55,000. Benjamin W. Kilgore Scholarships in the amount of $1,000 will be awarded to food science students each year from income from the endowment.

Dean J. E. Legates recalled the long association of the Kilgore family with NCSU and the Raleigh business community.

"Benjamin Wesley Kilgore was a leader in every progressive movement in North Carolina during the first half of this century," Legates said. Among other things, he was the first dean of agriculture at NCSU, the first director of the N. C. Agricultural Extension Service, a director of the N. C. Agricultural Experiment Station (now N. C. Agricultural Research Service), and the state chemist. He also founded Pine State Creamery in Raleigh, of which his grandson, Ben Kilgore IV, is now president.

Kilgore died in 1943 at the age of 76. NCSU named Kilgore Hall in his honor in 1951.

Legates noted that the Kilgore family has continued its support of NCSU, especially through the N. C. Dairy Foundation. James D. Kilgore was the recipient of NCSU's highest non-academic honor, the Watauga Medal, last March. Money for the endowment came from holdings in Kildaire Farms, a Cary development being built on a 900-acre dairy farm started by the Kilgore family.

Kocide Scholarship

The most unique new scholarship came to SALS from Kocide Chemical Corporation via a Martin County farmer.

The farmer, B. Mitchell Harrison, won a sweepstake conducted by Kocide. As part of his prize, he could designate a university of his choice for a $4,000 scholarship. He chose NCSU, and the scholarship was presented to Scott Tyson at a luncheon on June 11. Tyson, a native of Nashville, is a freshman majoring in agronomy. Kocide is best known in North Carolina for a fungicide that it manufactures for use on peanuts. ■

SALS Today
SCHOOL OF AGRICULTURE & LIFE SCIENCES

Editor: **Tom Byrd**

Assistant Editors: Jan Christensen, Elbert Reid
Graphics: Diane Probst

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(Continued from page 3)

What the university proposed and Reynolds accepted was an endowment to supplement the salaries of distinguished professors in the School of Agriculture. The endowment was established in 1950 when Reynolds gave the university 10,000 shares of class B stock in R. J. Reynolds Tobacco Company. The stock was valued at $340,000 at the time. It is now worth about $5 million.

Dean of Agriculture James H. Hilton described the Reynolds gift at the time as "probably the greatest single program to come to State College's School of Agriculture since its founding."

Dean J. E. Legates believes the endowment, one of the first of its kind in the nation, was a milestone "in encouraging scholarship among the agricultural faculty."

Reynolds Coliseum

Among those working with Hilton in getting the endowment established were Chancellor J. W. Harrelson and William D. Carmichael, controller of the UNC System.

"Billy Carmichael may have been at Chapel Hill, but he took care of us," Legates commented. Carmichael Gym on the NCSU campus is named in his memory. ■

Dean Outlines Agricultural Requirements

Dean J. E. Legates

Farmers need strong technological support and economic justice, Dean J. E. Legates has told the House Agriculture Committee.

The committee, chaired by Congressman Kika dela Garza (D-Tex), held a public hearing on July 30 at Pfeiffer College. The hearing was arranged by Congressman Bill Hefner (D-NC) of Eighth District. Its purpose was to review issues relating to the 1985 Farm Bill.

Legates praised Title XIV of the 1981 Farm Bill, which affirmed in a positive manner the partnership between the federal government and land-grant universities in agricultural research, extension and teaching.

He concluded his testimony with four observations "that need to be recognized as 1985 farm legislation is framed." Here are those observations:

"First, citizens of this nation will continue to expect an adequate supply of wholesome food at as low a proportion of their incomes as they can expend. Our long-standing national policy of support for agricultural research, extension and conservation has been based on the importance of food and fiber to undergird the structure of our economy and all components of our society. I do not object to a low-cost food policy provided other policies allow farmers to share fully in the abundance which they produce. Unless we do this, we shall destroy our agricultural system.

"Secondly, efficient and abundant food and fiber production must and will continue to be a major strength of this nation. Our agricultural productivity is one of our most valued strategic resources for a strong national defense and economic posture. Agricultural exports, which totaled $43.8 billion in 1981, have provided a strong positive increment in our international trade balance. Natural amenities such as soil, climate and moisture, coupled with our encouragement of the ingenuity and commitment of the American farmer to use new technology, must continue to give our nation a competitive edge in the production of food and fiber.

"Thirdly, with reasonable weather and market incentives, our ability to produce will far exceed domestic consumption. Our nation's population may approach 260 to 270 million by the year 2000. Yet in recent years we have been exporting about a third of our agricultural production. These exports are essential to permit efficient use of our investments in agriculture and to meet the needs of people overseas. Our downturn in the domestic farm economy is closely related to reduced exports. This means we must focus sharply and persistently on export opportunities. We must provide products which these markets desire and sweep away the notion that other nations will be anxious to purchase our 'left-overs.'

"Lastly, farmers as producers of food and fiber will become an increasingly smaller segment of society. While it is true that a major reduction in farm population has taken place, and that we now have only 2.3 million farms, the decline in farm numbers continues. Implementation of new technologies to maintain efficiencies and competitiveness requires a high capital investment. Today, over one trillion dollars is invested in agricultural production, apart from investments in processing, marketing and distribution. Consumer demand for additional processing of raw products means that the farmers will receive a smaller portion of the retail food dollar. Already, the farmer's share has declined to just over 31 cents. These and other outside pressures will force producers to organize more cohesively to retain an adequate foothold in our competitive economy. We must preserve and strengthen the opportunity for farmers to join together in cooperative ventures for their mutual benefit."

Nineteen other farm leaders offered testimony at the hearing. ■

Agri-Life Prexy Motivates Clubs

By Arty Schronce

Ruth Hamrick is a double president. She is president of the NCSU Ag-Life Council and president of the NCSU Food Science Club. She will be a December bride and a May 1985 graduate. And she is busy.

As president of the Ag-Life Council, the most important student organization within SALS, Miss Hamrick oversees representatives of 20 student clubs within the school.

The council encourages interaction between different parts of the school by promoting and sponsoring activities for the entire school and for individual clubs.

The council receives money from student fees, which it uses or allocates to clubs for projects and activities. "We make sure clubs put forth efforts to raise their own funds before allocating any," says Miss Hamrick.

One of Miss Hamrick's goals is to get the few inactive clubs within the school back into action and taking part in the Ag-Life Council. "I would like to find out the general mood of the whole school, and the best way to find out is if the council has representatives from all the clubs."

Some of the events scheduled for the fall semester include University Day, the annual chicken barbecue catered by the Poultry Science Club and Alcohol Awareness Week.

Prior to her election as Ag-Life Council president, Miss Hamrick was elected president of the Food Science Club, which is one of the most active clubs in the entire university. The club makes and sells sausage, muscadine jelly and muscadine wine jelly. The club also has a cheese sale each year and operates a dairy bar at the State Fair. Last year the club initiated a newsletter to keep its members informed.

Miss Hamrick is from Cary. She will graduate in May with a B.S. degree in food science. She says she will interview for jobs as well as apply to graduate school, but is uncertain about career plans at present.

But before Miss Hamrick puts on the cap and gown, she will don a wedding dress Dec. 22 to marry Michael George Watkins, a Clemson graduate.

Agri-Life President Ruth Hamrick

Other officers of the Ag-Life Council are Vice President Chip Cunningham, a zoology major from Cary; Treasurer Karen Lee, an animal science major from Washington, N.C.; Secretary Beth Bayless, an animal science major from Raleigh; and Reporter Dan Singer, a zoology major from Greensboro. ■

(Continued from page 1)

Daily gains and other data will be recorded for 140 days, after which most of the best bulls will be sold.

"The purpose of the testing program is to identify bulls that are genetically superior," explained Extension Livestock Specialist Roger McGraw. Rate of gain, fat deposition and frame size are among the economic traits that are moderately to highly heritable.

Cattlewoman Smith says the bull testing program has provided "a learning process for me."

"It is a good tool to see how well animals perform and how well they perform in comparison to those of other producers," she added.

Mrs. Smith of Bahama in Durham County runs a herd of about 25 registered brood cows, while her husband, J. Harold Smith, works for IBM.

Cattleman Ledford says the testing program "helps me to market bulls."

"It also helps me to tell what herd sires are doing. I've increased the weaning weight of my calves from 380 to 620 pounds in seven years. That's what performance testing has helped me to do," he added. ■

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May 15, 1984

MEMORANDUM TO: Dr. Larry Clark
Dean J. E. Legates
Dr. E. W. Glazener
Dr. W. C. Grant

FROM: H. B. Craig
W. H. Johnson

SUBJECT: Research Apprenticeship Program Orientation

On Monday, June 11, at 8:30 a.m., we will begin the USDA-NCARS sponsored Research Apprenticeship Program. It will end on Friday, August 10, 1984. The meeting on June 11 will be held in Room 2, Patterson Hall.

A total of five high school juniors have accepted our invitation to participate and they have been assigned to work with faculty in five different departments. The apprentices and their faculty research supervisors will be oriented at the above time and place. We would appreciate your attendance, if possible, to welcome them and to make any comments you deem appropriate. Please let us know if you will be able to attend.

Agricultural Extension Service

North Carolina State University at Raleigh

TAR HEEL ECONOMIST

Department of Economics and Business

July 1984

INTERNATIONAL DEVELOPMENT ASSISTANCE

The Dimensions of Development Assistance

Daniel A. Sumner

We are living in a world in which interactions among people of different nations is commonplace and vital. Huge differences in the economic well-being of the bulk of the population prevail in different parts of the globe. For example, per capita income in Switzerland in 1981 was $17,439, whereas in the Sudan it was $380.

The economies of poor and wealthy countries differ in more than just average incomes. India, for example, has 36 percent literacy, an infant mortality rate of 121 per thousand, and 69 percent of the labor force in agriculture. In the United States, the figures are 99 percent literacy, an infant mortality rate of 12 per thousand, and 2 percent of the labor force in agriculture.

Wealthy Countries Aid Poorer Ones

Because of these huge economic differences, some of the interactions between countries have been attempts by people in wealthy countries to assist the economic development of poorer countries. (Economic development means sustained growth in opportunities of people to live full and healthy lives, and for most purposes, wealth is a reasonable measure of opportunity.) The role of official development assistance should not be overemphasized. Table 1 shows that international aid is small relative to donor GNP. This is especially true for the United States. For some poor countries aid is a large part of domestic income, for others it is a small factor. For example, between 1976 and 1979 aid was about 15 percent of GNP in Bangladesh, whereas in India it was only 1.4 percent of GNP.

In considering development aid in more detail in the next articles, several distinctions are useful. First, the purpose of international assistance might be broken down into three categories: (1) Emergency assistance or disaster relief does not attempt to foster sustained growth; its objective is the short run. (2) Military or strategic aid is motivated by the defense (or offense) of the donor or recipient. (3) Development aid attempts to foster sustained growth. Although military and emergency goals clearly are related to development, they may be thought of as separate aid efforts.

Different Forms of Aid

Development aid may be provided in several forms and by different sources. Grant funds provide either general investment funds or specific services. Loan funds must be repaid but are offered as development assistance at below-normal market rates. Wealthy nations provide both grants and low interest loans as direct bilateral aid to specific countries. They also band together to provide aid through the United Nations, the World Bank and other multinational organizations. In addition, private citizens provide development assistance through religious groups and other volunteer organizations.

Table 1. Official development assistance from rich to the poor, 1981

From developed country listed to any LDC	Aid[a]
All OECD[b] (millions of $)	25.6
Percent of GNP	0.35
Netherlands (millions of $)	1,510
Percent of GNP	1.08
Japan (millions of $)	3,171
Percent of GNP	0.28
United States (millions of $)	4,782
Percent of GNP	0.28

[a] Official development assistance, value of flows on concessional terms.
[b] OECD countries include the wealthy industrialized non-communist countries.

Development Aid in a Market Context

Edward W. Erickson

Economics is the study of markets. Economic development, therefore, can be defined as the process through which markets operate to increase per capita income. This emphasis on markets is very important because economic development activities often are thought of almost exclusively in terms of governmental economic development aid.

Private Financial Flows Important

If economic development aid is to achieve sustainable increases in per capita incomes in developing countries, however, such aid must promote activities that generate increased marketable outputs. The flows of financial resources from developed to developing countries that are most likely to pass such a market test are private flows at market terms. Such private financial flows at market terms accounted for over 60 percent of the $88 billion of development cooperation in 1981, and were over 50 percent larger than the sum of all official governmental development assistance, other official flows, and grants by private voluntary agencies.

It would be possible to argue that the sustainable economic development impact of private flows at market terms is much more than 50 percent greater than that of all other development cooperation. This is because the remaining financial flows are apt to have a significant component of international log-rolling and pork barrel in them.

For example, if the USSR had not financed Egypt's High Aswan Dam, it is likely that the United States would have. It is now widely recognized that this massive international public works project actually may be a net drain on the agricultural productivity of the Nile Valley.

Public Financing Aids Research

On the other hand, there are very large numbers of development projects for which public financing makes sense. The most prominent of these are activities analogous to those of the U.S. Agricultural Research and Extension Services.

Although there is a large volume of highly productive research and extension work to be done in developing countries, the individual projects are relatively small in scope. General research results originating at international agricultural experiment stations must be tailored in individual countries to local conditions and targeted at specific market opportunities.

This process can best be achieved through decentralized decision making where individual decisionmakers respond to the particular costs and incentives facing each of them. That is a fancy way of describing markets.

The importance of relying upon markets in the implementation of publicly funded development aid cannot be overemphasized. The best example of the costs of suppressing markets is agriculture in the Soviet Union. Soviet agriculture has ample arable land resources, a literate and skilled labor force, modern capital equipment, and a sophisticated technological base. Yet Russia cannot feed herself. The only component of Soviet agriculture than can be said to work is the sector of small market-oriented activities operated on a private initiative basis by individual farmers.

Reliance on Market Processes

In addition to providing the best basis for helping development aid achieve sustainable increases in per capita incomes in developing countries, reliance upon private initiatives within a market framework has another very important advantage. Most developing countries are just beginning to emerge from a set of essentially feudal social, economic and political institutions. For this reason, it may be impossible to do what amounts to "democracy transplants" that are instantaneously successful.

Over the last several hundred years, however, there can be no question that individual liberty and political freedom have prospered best in those societies where markets have flourished. Thus, if a long-run objective of U.S. development aid is encouraging the evolution of a world of well fed democracies, primary reliance upon market processes is the best strategy.

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Role of U.S. Universities in International Technical Assistance

A. J. Coutu

The broad role of the U.S. university in international technical assistance is twofold: (1) to improve the efforts of less-developed countries to assist themselves in the fields of research and education; (2) to provide to government, business and students within the United States knowledge on political, economic, cultural and social processes and issues in other countries.

As U.S. universities attempt to assist other countries, they focus on major factors influencing economic development—education, technological change and the need to develop quality institutions.

Education Sound Investment

One of the consistently sound investments around the world has been education and training. This also is one of the investments that may be very difficult for poor countries to make without some assistance. It may be hard to use borrowed capital to invest in better education because without indentured servitude lenders find it hard to enforce payments. Thus, development assistance focuses on human capital in the form of improving technical training and formal schooling at all levels. One of the roles of universities in the United States has been to provide higher education to students from poor countries. Especially in agriculture, training in modern techniques and in research have had major payoffs in growth in poor regions.

This focus fits well the major domestic mandate of U.S. universities, which is to train people, seek to adapt and acquire new knowledge and to transfer knowledge to change the ways things are done. Also, the U.S. university as an institution has an organizational structure, a set of decision processes, mechanisms for achieving further growth and processes for linking with its clientele.

Foreign Nationals Trained

Thus, the dominant role of the U.S. university in international development is to extend its mandate beyond U.S. boundaries, to train foreign nationals here or abroad, to assist in creating technological change and transferring such knowledge. Also, when the foreign institutional setting is inadequate to perform these tasks, the U.S. university has an opportunity to assist less developed nations in the process of institution building.

The other role of the U.S. university in the international technical assistance area—a knowledge-generating and -transfer process—is focused within the United States itself. What are the political, economic and social conditions in other countries? How do actions taken in other countries influence the decisions and well-being of the U.S. population? How does U.S. university involvement in international development efforts benefit the United States? These questions and others are addressed in class lectures, seminars and workshops on the campuses of U.S. universities. Also, U.S. university faculty with international experience participate in public forums and publish in scholarly as well as popular publications. Many U.S. researchers benefit from conceptual and methodological ideas as well as material (breeding lines) goods that flow from links with foreign colleagues.

Funding Sources

Financial help is required to support these two international roles of a U.S. university. The dominant source of funding is from the U.S. Agency for International Development (USAID). An agency of the U.S. State Department, USAID supports research, training, technology transfer, institutional development, policy analyses and private sector developments abroad. It also supports generation and transfer of knowledge within the United States about other countries. Other sources of support are North Carolina and other state governments, private U.S. non-governmental organizations, the United Nations, World Bank, three regional international banks, and the less-developed countries themselves through loans from these various sources.

FORTHCOMING ISSUES

August—Comparable Worth/Sex Discrimination

September—Farm Financial Planning

The Economics of Aid

Daniel A. Sumner

The diverse pattern of economic well-being around the world provides a strong challenge to our understanding of how and why people in some nations become relatively wealthy while others remain predominantly poor. Although not a prerequisite to development assistance, understanding economic development certainly can provide a basis for more effective aid.

Investment Encouraged

Growth means investment so the stock of physical and human capital with which people work becomes larger and more productive. An abundant natural resource base of a country is neither necessary nor sufficient for development. The keys to rapid growth are encouraging high levels of investment and encouraging sound investments that bring high returns. Effective development assistance can play a role in both these issues.

People in poor countries are economic agents like people in wealthy countries. It has been shown convincingly (by Nobel Prize winner T. W. Schultz and others) that poor people save, invest and allocate resources effectively, given their very limited bases of capital (both human and physical) and information. The implication is that if profitable investments are available, poor (mostly rural) people will take advantage of them. One of the roles of assistance may be to encourage the development of investment opportunities in poor rural regions. This involves helping provide information and reducing barriers that limit potential payoffs to economic activity among poor people.

Agricultural research is an investment that may have high returns but that often is difficult to pursue in poor nations. Payoffs to agricultural research in poor areas often are spread widely among farmers and consumers. No single farm enterprise can afford to provide these investments when the returns are widely dispersed. This is one reason governments traditionally have been sources of research funds. Governments in poor countries, however, often lack funds and the stability to make long-term investments, so international assistance has played an increasingly important role. The innovation and diffusion of high-yielding grain varieties (the green revolution), for example, was fostered by agricultural research sponsored by development assistance.

Policy Reform Encouraged

Development assistance also can help encourage the removal of institutional barriers that block economic progress. The United States, the World Bank, and other donors also can attempt to provide analysis and direction to policy reform in poor countries. Development assistance is *not* a solution to world poverty but aid will continue and it will continue to do some good.

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SCHOOL OF AGRICULTURE AND LIFE SCIENCES
North Carolina State University
Office of the Associate Director, Academic Affairs
107 Patterson Hall

MEMORANDUM

TO: Dr. Clark

We would like for you to join us if your schedule permits.

7/30/84
Dr. Clark-
Do this a meeting you would like to attend? Carol

_____ Note and pass to next person.
_____ Note and return.
_____ Note opinion and return.
_____ Note—do not return.
_____ Note for further discussion.
_____ Please handle.
_____ Please answer, with cc to me.
_____ For your information and files.
_____ Do you approve?
_____ Needs your signature.
_____ Discuss with me.
_____ Please advise me.

Date _____ (Sign) Marie Holt for Dr. H. B. Craig

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July 20, 1984

MEMORANDUM

TO: Mark P. Alston
Phyllis A. Mack
Sandra Nelson
Shawna Sessoms
Donna R. Tabron

FROM: W. H. Johnson
H. B. Craig

SUBJECT: Meeting to Complete Evaluation Form and Discuss Curricula in the School of Agriculture and Life Sciences

Please plan to meet in Room 5 of Patterson Hall on Monday, August 6, 1984 at 8:30 a.m. to review your summer work and complete an evaluation form. Also, curricula in the School of Agriculture and Life Sciences will be discussed for your information. A photographer will be present to make a group picture. This meeting will last approximately one hour.

CC: Dr. E. W. Glazener

Dr. James H. Young
Dr. Bryan H. Johnson
Dr. Robert M. Petters
Dr. George L. Catignani
Dr. Betty L. Black
Dr. Thoyd Melton
Dr. Bill Grant
Dr. Larry Clark
Dr. H. B. Craig

LOOKING AHEAD

The Future of North Carolina Agriculture

SCHOOL OF AGRICULTURE & LIFE SCIENCES

North Carolina Agricultural Research Service
North Carolina Agricultural Extension Service
Academic Affairs

1983 ANNUAL REPORT

NORTH CAROLINA STATE UNIVERSITY

Agricultural Research Service—One hundred third Annual Report. For the period January 1, 1983 to December 31, 1983.

Agricultural Extension Service—Annual Report for the period January 1, 1983 to December 31, 1983.

Academic Affairs—Annual Report for the period January 1, 1983 to December 31, 1983.

CONTENTS

DEAN'S MESSAGE

Agriculture and those engaged in it are always projecting into the future—mostly with eternal hope. However, hopes for high yields at spring planting too often are dampened by drought, extreme heat, disease and insects as the growing season progresses. Even if nature is kind, an overly abundant harvest may depress prices so that profits vanish. Yet the world must be fed; and we must look to the future with anticipation and confidence. Abundant harvests provide some insurance against successive lean years, although even with modern methods of food preservation and storage, the world has less than a year's supply of food available at a given time. Put another way, the world is only one year or growing season away from starvation.

Certainly we do not view either U.S. or North Carolina agriculture as likely to reach such a desperate situation unless catastrophic conditions press upon us. We do, however, need to look ahead so that we can assist in making the future 'happen' in ways that are to our advantage. This is the purpose of the 1983 Annual Report for the School of Agriculture and Life Sciences. Our scientists, specialists, and editors have looked forward over the next decades to identify problems we will have to solve and issues we will have to confront in order to maintain a strong on-farm economy and a natural resource base which will allow us to be responsive to state, national, and worldwide challenges.

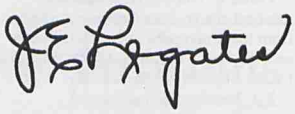
Undergirding the analyses of issues and projections are four assumptions: First, **citizens of this nation will continue to expect an adequate supply of wholesome food, at as low a proportion of their incomes as they can expend.** Our long-standing national policy of support for agricultural research, extension, and conservation has been based on the importance of food and fiber to the basic structure of our economy and to all components of our society. Yet even when times are tight for producers and we know they are suffering financially, each minor rise in food prices is met with characteristic and traditional grumbling. This occurs despite the fact that fluctuations in farm prices for many commodities have only a minor influence on retail prices.

Secondly, **efficient and abundant food and fiber production must and will continue to be a major strength of this nation.** Our agricultural productivity is one of our most valued stategic resources for a strong national defense and economic posture. Agricultural exports, which totaled $43.8 billion in 1981, have provided a strong positive increment in our international trade balance. Natural amenities such as soil, climate, and moisture, coupled with the ingenuity and commitment of the American farmer to use new technology, must continue to give our nation a competitive edge in the production of food and fiber.

Thirdly, **with reasonable weather conditions and market incentives, our ability to produce will far exceed domestic consumption requirements.** Our nation's population may approach 260 to 270 million by the year 2000. Yet in recent years we have been exporting the equivalent of about one-third of our agricultural production. These exports are essential to our economy, permit efficient use of our investments in agriculture, and meet the needs of people overseas. Our downturn in the domestic farm economy is closely related to reduced exports. This means we must focus sharply and persistently on our export opportunities. We must provide products which the markets desire and sweep away the notion that other nations will be anxious to purchase our "left-overs." We are part of the world economy and other suppliers will be sought if we do not provide a stable supply of products that are competitive in price and quality.

Lastly, **farmers as producers of food and fiber will become an increasingly smaller segment of society.** While it is true that the major reduction in farm population has taken place, and that we now have only 2.3 million farms, the decline in number of farm operations continues. Implementation of new technologies to maintain efficiencies and competitiveness requires a high capital investment. Today, over one trillion dollars is invested in agricultural production, apart from investments in processing, marketing, and distribution. Assets needed for farm production today too often cannot be earned in one individual's lifetime; hence, family farms will incorporate to preserve the equity in production units from generation to generation. Consumer demand for additional processing of raw products means that the farmer will receive a smaller portion of the retail food dollar. Already, the farmer's share of the food dollar has declined to just over 31 cents. These and other outside pressures will force our producers to organize more cohesively to retain an adequate foothold in our competitive economy.

The future always has uncertainties. Without them life could be dreadfully monotonous. These uncertainties faced one day at a time can be exciting and challenging. I have a profound respect for the agricultural leadership and citizens of North Carolina, and a sense of confidence that they will commit themselves to meet such uncertainties for the common good. The last three decades of progress in agriculture attest to this conviction. Our School has been privileged to be a part of this drama, and we hope the consideration given to the topics which follow may in some measure point the way toward an even more productive future.



J.E. Legates
Dean, School of Agriculture and Life Sciences

DeLoatche Wins Alumnus Award

DeLoatche

The School of Agriculture and Life Sciences at North Carolina State University has presented its 10th annual Distinguished Alumnus Award to G. Brantley DeLoatche of Durham. DeLoatche is senior vice president of FCX, Inc. He is also well known for his leadership with Central Carolina Farmers Exchange, Inc., a five-county cooperative with headquarters in Durham.

Announcing DeLoatche's selection, Dean J.E. Legates said, "Brantley has devoted his entire adult life to agriculture and to those associated with this vital profession."

DeLoatche graduated from NCSU in 1942 with a B.S. degree in agricultural education. He has maintained his ties with NCSU, serving as president of the NCSU Foundation, Inc., and as director and member of many other NCSU-related organizations. "He has been receptive to our new technology, entertained and toured our visitors, worked with and hired our students, and offered us his counsel," Legates said.

Awards to Faculty

Frank E. Guthrie (Entomology) received the O. Max Gardner Award from the University of North Carolina and the North Carolina Award presented by the State of North Carolina.

F.J. Hassler (Biological and Agricultural Engineering) was elected Fellow in the American Association for the Advancement of Science and received the Outstanding Engineering Achievement Award from the N.C. Society of Engineers.

Others elected Fellows in their professional societies were: Fred R. Tarver, Jr. (Food Science), Institute of Food Technologists. Kurt J. Leonard (Plant Pathology), American Phytopathological Society. Harold E. Pattee (Botany), American Peanut Research and Education Society. A. Ronald Galland and Francis G. Giesbrecht (Statistics), American Statistical Association. W.A. Jackson and P.A. Sanchez (Soil Science), American Society of Agronomy. Josef S. Gratzl and Hou-min Chang (Forest Resources), Academy of Wood Science.

Tom J. Monaco (Horticultural Science) received the Outstanding Weed Science Teacher Award and the CIBA-GEIGY Agricultural Recognition Award from the Weed Science Society of America.

V.L. Christensen (Poultry Science) received the Poultry Science Association Research Award.

Gene Namkoong (Genetics) received the Alexander von Humboldt Senior U.S. Scientist Award.

In Crop Science, Guy L. Jones received the Agronomic Extension Education Award and R.P. Patterson the Agronomic Resident Education Award, both presented by the America Society for Agronomy. Paul Harvey (retired) was awarded an honorary doctor of science degree by the University of Nebraska, and A.D. Worsham received the Distinguished Service Award from the Southern Weed Science Society.

In Entomology, Richard C. Axtell was elected president of the American Mosquito Control Association; Wayne M. Brooks, president of the Society for Invertebrate Pathology; T. Jack Sheets, president of the Weed Science Society of America; and George G. Kennedy received the Bussart Award from the Southeastern Branch of the Entomological Society of America and Robert L. Rabb (retired) was elected president. Kenneth L. Knight (retired) received the Medal of Honor Award and the Belkin Award from the American Mosquito Control Association.

In Sociology and Anthropology, Selz C. Mayo (retired) received the Distinguished Rural Sociologist Award from the Rural Sociological Society, and Maurice E. Voland received a Certificate of Recognition from the Forest Service, USDA. Ronald C. Wimberley served as president of the Sociology Section, Southern Association of Agricultural Scientists.

Thomas W. Joyce (Forest Resources) received the Sigma Xi Outstanding Young Scientist Award.

David R. Lineback (Food Science) was named president of the American Association of Cereal Chemists; Ian S. Longmure (Biochemistry) is president elect of the International Society on Oxygen Transport to Tissue.

Daniel L. Solomon (Statistics) was elected an Ordinary Member of the International Statistical Institute.

In Food Science, Lynn G. Turner was elected a Teacher Fellow of the National Association of Colleges and Teachers of Agriculture, and William M. Walter, Jr. received a Certificate of Merit from the USDA.

T. Carlton Blalock (Administration, retired) received the National Ruby Award from Epsilon Sigma Phi.

Charles F. Pugh (Economics and Business) was named Tobacco Man of the Year by the Tobacco Merchants Association of the U.S.

Distinguished Service Awards of the National Association of Extension Home Economists went to Helen H. Dosier (Alleghany County), Jane L. Ebert (Davidson County), Mavis G. Johnson (Cumberland County), and Lois P. Williams (Mitchell County).

Receiving the Distinguished Service Awards of the National Association of Extension 4-H Agents were Rebecca Beets (Watauga County), Pamela C. Outen (Cabarrus County), and Sue Peck (Mecklenburg County).

Distinguished Service Awards of the National Association of County Agricultural Agents went to John Crawford (Guilford County), S.D. Little, Sr. (Person County), Kenneth Patterson (Alexander County), Gordon Sawyer (Camden County), Chester Stocks (Lenoir County), and David E. Terrell (Mitchell County).

In Agricultural Communications, William S. Humphries was named Agricultural Journalist of the Half-Century by the N.C. Seedsmen's Association, and W.L. Carpenter received the Service Award of Agricultural Communicators in Education.

C.R. Parkhurst (Poultry Science) received the Alumni Distinguished Teaching Award. Receiving the University's Outstanding Teacher awards were George T. Barthalmus (Zoology), Myron W. Kelly (Forest Resources), Wendell H. McKenzie (Genetics), and Tommy E. Wynn (Botany).

The University's Outstanding Extension awards went to James R. McGraw (Forestry), Woodrow Upchurch (Agricultural Communications), W.M. Lewis (Crop Science), and Joe Brooks (District Leader).

The NCSU Alumni Association's Outstanding Extension Award went to J.D. George (Adult and Community College Education), and the Outstanding Research Award went to R. Wayne Skaggs (Biological and Agricultural Engineering). The Association's Award of Merit went to George Hyatt (Adult and Community College Education).

R.D. Mochrie (Animal Science) received the NCSU Distinguished Service Certificate.

State Extension Leadership awards went to D.G. Harwood, Jr. (Administration), Julie B. Landry (Ashe County), and Daniel Godfrey (A&T).

Receiving the Epsilon Sigma Phi Distinguished Service Award were E.J. Boone (Adult and Community College Education), G. A. Sullivan (Crop Science), and Isabelle Buckley (Home Economics, retired).

T. Everett Nichols, Jr. (Economics and Business) was named a Philip Morris Extension Specialist.

In Entomology, Richard C. Axtell was elected president of the American Mosquito Control Association; Wayne M. Brooks, president of the Society for Invertebrate Pathology; T. Jack Sheets, president of the Weed Science Society of America; and Robert L. Rabb (retired) president of the Entomological Society of America.

Richard J. Thomas (Forest Resources) was elected vice president of the Forest Products Research Society; Glenda M. Herman (Home Economics) served as vice president of the American Association of Housing Educators.

In out-of-country activities, Walter J. Dobrogosz (Microbiology) received a Fulbright award to conduct research in Sweden; Bruce S. Weir (Statistics) was awarded a Guggenheim Fellowship for Scotland.

Two Named to Administrative Positions

Johnson

Two administrative positions were filled in the School of Agriculture and Life Sciences in 1983.

Dr. William H. Johnson was named to succeed retiring Dr. Thurston J. Mann as assistant director of the Agricultural Research Service. Johnson, a professor in biological and agricultural engineering, has been on the faculty and project leader in tobacco processing research since 1961. A native of Fayetteville, he holds three degrees in biological and agricultural engineering from NCSU. Mann had served as a member of the NCSU faculty and administration since 1949.

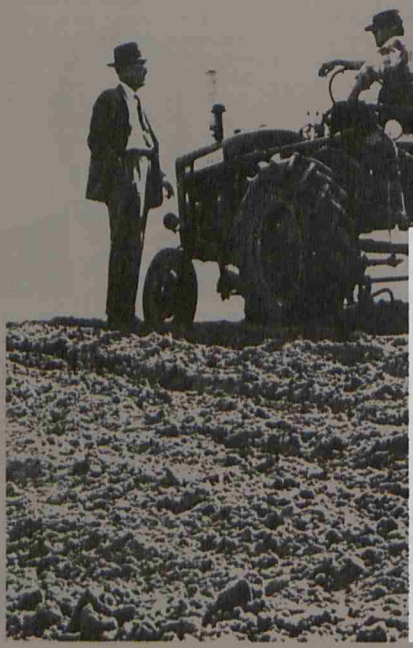
Hobgood

Dr. Thomas N. Hobgood was named chairman of the Northeastern Extension District on February 1. He replaced Mrs. Josephine Patterson who retired in 1982. A native of Granville County, Hobgood holds two degrees from NCSU and the doctorate from Florida State University. In his Extension career he has served as assistant agent, Person County; chairman, Surry County; community development specialist; and CRD program leader for the Western and Southwestern districts.

THE CHANGING AGRICULTURAL SCENE

Tremendous changes have taken place in U.S. agriculture over the past fifty years, many of them brought about by technological developments. The farm population and the farm labor force have been reduced to a tiny fraction of our population. Farm productivity per worker has skyrocketed with the introduction of prolific new varieties and widespread mechanization. Agriculture has become a high tech enterprise and will become increasingly reliant on technological innovation for sustaining productivity.

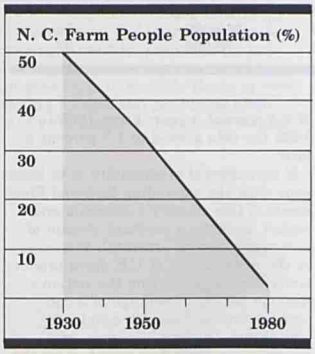
Agricultural policies can be associated with certain major national trends. Innovations in farm policy have frequently represented variations on basic themes rather than new directions. The past decades have seen cyclical policy shifts which have worked with uneven success to balance the forces of supply and demand and maintain reasonable prices for consumers and income stability for farmers.



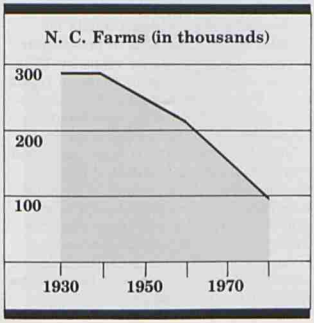
DECADES OF CHANGE

1950-1980

Of the multitude of changes in North Carolina and U.S. farming in recent decades, the most dramatic has been the exodus of people from farming. Today, farm people account for only 3.2 percent of the state's population.



Although the number of farms and the number of farmers have fallen sharply since 1950, agricultural output has not declined. On the contrary, it has increased substantially, and income from agriculture and forestry contributes significantly to the state's economic health.



During the past few decades, North Carolina has emerged as a great poultry state, ranking first in turkeys, fourth in broilers, and seventh in egg production. While continuing to hold its leadership in total tobacco production and flue-cured tobacco, it has also climbed to number one in sweet potato production and ranks first in farm forest products receipts. It is third in peanut production, fourth in burley tobacco, seventh in number of hogs on farm, eighth in apples, and ninth in cash receipts from crops. It now ranks tenth in number of farms and 11th in cash receipts from all commodities.

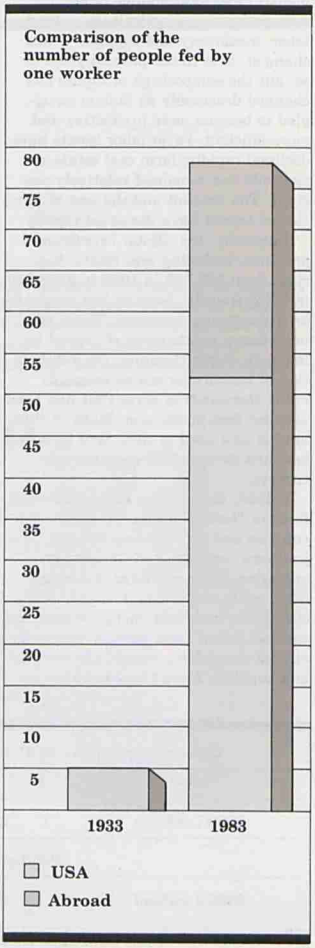
Science Power

Science power has played a tremendously important role in increased production and greater production efficiency. Research has enabled dairy farmers to boost milk output per cow from 4,460 pounds in 1953 to 12,870 pounds in 1982. This tremendous gain resulted from a combination of improved management, feeding, and genetics. Development of techniques for artificial insemination greatly accelerated herd improvement through selection of sires from among the best in the state and nation.

Similarly, as a result of selective breeding using performance tested boars, today's 220 pound top market hogs contain 35 percent less total body fat and a proportionate increase in edible products compared with hogs of 20 years ago.

Research has made it possible for broilers to reach market weight in only seven weeks with 8.5 pounds of feed The feed conversion ratio for broilers is 2.05 — a very high standard of efficiency. Eggs produced per laying hen rose from 206 in 1960 to 241 in 1982, a 17 percent improvement.

Spectacular increases occurred in crop yields from the early 1950s to the



early 1980s, as farmers turned eagerly to newly developed varieties bred for higher yield potential, improved quality, and resistance to plant diseases and even insect pests. They also learned to fertilize, irrigate, and apply pesticides to their crops more efficiently. In just three decades, statewide average per acre yields of virtually all crops increased substantially, some doubled, and a few even tripled.

Increases in yield per acre (selected N. C. crops)

	1950	1980	% change 1950-1980	% change 1980 to 1992*
Wheat (bu)	15	36	140	12.5
Corn (bu)	33	101	206	26.7
Peanuts (lbs)	1,110	2,825	154	13.3
Soybeans (bu)	16	25	56	36.8
Tobacco (lbs)	1,341	2,140	59	
Sweet potatoes (cwt)	60	140	133	

*Projected increases in yield (USDA Economic Research Service)

Changes in acreage 1950 to 1980 (selected N. C. Crops)

Crops	1950	1980	% change
Wheat	356,000	600,000	69
Corn	2.16 mill.	1.83 mill.	– 15
Peanuts	227,000	147,000	– 35
Soybeans	297,000	2.1 mill.	607
Tobacco (flue-cured)	640,000	313,000	– 51
Cotton	880,000	70,000	– 92

Capital Not Labor

While fewer people are needed per farm and on all farms in North Carolina and the nation, the capital investment required has increased enormously. The total volume of all resources used in agriculture — land, labor, machinery and supplies — has changed little in the past 25 years or so, but the composition of inputs has changed drastically as famers struggled to become more productive and more efficient. Farm labor inputs have declined rapidly; farm real estate nationwide has remained relatively constant. The amount and the cost of purchased inputs have increased rapidly.

Nationally, the capital investment per farm, including real estate, has risen from $18,739 in 1950 to $408,218 in 1982. Clearly, farming has ceased to be a shoestring operation. There has been heavy substitution of capital for labor. In North Carolina, the substitution of tractors for mules released many thousands of acres that had been used for feed production. Much of this land is now used to raise feed for hogs, beef and dairy cattle, chickens and turkeys.

In 1982, the average expenditure per farm in North Carolina for production supplies and services was $30,353. Major items included feed; interest on operating loans and farm real estate debt; seeds and plants; fertilizer and chemicals; fuels and energy; wages and contract labor; farm services (including custom operations, veterinary services and supplies, hired transportation, insurance, marketing expenses, cash and share rent, and miscellaneous business services); livestock and poultry purchases and expenses; farm and motor supplies; building, fencing and farm improvements; and taxes.

Other major developments affecting agriculture in North Carolina over the past 30 years or so have included improved farm-to-market transportation, greater rural access to mass media, the rising importance of export markets, and improved living standards for farm and rural people.

What's Ahead?

Agriculture is, of course, a dynamic industry that is constantly searching for new technology. It has been on the "high tech" track for at least 30 years. As a result, agricultural productivity — total farm output per unit of input — has outpaced industrial productivity by a considerable margin. From 1950 to 1965, farm productivity grew at a rate of 2.4 percent a year. From 1965 to 1982 the rate slowed to 1.7 percent a year.

If agricultural productivity is to keep pace with the expanding food and fiber needs of this country's domestic and export markets, a constant stream of new technology is essential. Increases in the growth rate of U.S. farm productivity depend in part on the nation's farmers taking advantage of a continuous flow of research developed technology. In part, of course, increases also depend on weather, on the types of farm programs in effect, on domestic economic conditions affecting demand for farm products, and on export demand, which in turn is affected by a host of factors including international trade barriers and the strength of the American dollar relative to other currencies.

New Technology

The technology already exists for North Carolina farmers to boost their average yields on major crops by 15 to 20 percent with little increase in input costs. Further increases of 5 to 15 percent can be expected as new technologies now being tested are applied.

Use of conservation tillage, improved nitrogen fixation, integrated pest management, development of drought resistant varieties, and double cropping will contribute to improvements in productivity in the next decades. Over the longer term, benefits from biotechnology research will begin to be realized in improved productivity.

Cash receipts from N. C. farm marketing 1951 to 1981.

1951	1981	%
$829.7 million	$4.1514 billion	500
	Production Expenses	
$492.3 million	$3.5616 billion	720

Of the world's 350,000 plant species, mankind depends on only 14 as major food and fiber crops. Biotechnology will enable agricultural research scientists, in time, to develop new crops or greatly improved varieties of old crops. Farmers will benefit from enhanced photosynthesis to improve plant efficiency and crop yields. Genetic research now in progress will produce rapid development of plants and animals that can withstand diseases and insects. Improved strains of nitrogen-fixing bacteria, and, perhaps eventual transfer of nitrogen fixation to plants will reduce fertilizer needs. Improvements in reproductive efficiency will be realized in animal production.

A Favorable Climate

Future land-use policies will need to balance flexibility in the use of land with the desire to meet national and international food demand.

With research-developed technology and a political and economic climate offering favorable incentives for production, American farmers can be counted upon to do their share in overcoming hunger and producing abundantly for people at home and abroad.

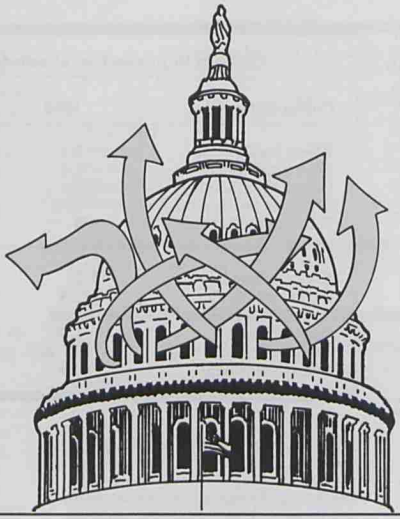
Changes in production of selected N. C. commodities

Commodities	1950	1980	% Change
Wheat (million/bu)	5.3	10.5	98
Corn (million/bu)	71.4	140.9	97.3
Peanuts (million/lbs)	322.5	555.6	72.3
Soybeans (million/bu)	4.75	34.7	630.5
Tobacco (million/lbs)	858	744.7	−13.2
Hogs (million/lbs)	311	849.2	173
Cattle (million/lbs)	111.8	279	150
Milk (billion/lbs)	1.56	1.63	4.5
Eggs (billion)	1.27	3.17	148
Broilers	78.7 mill.	1.6 bill.	1,933
Turkeys (million)	9.3	405	4,255

Land-grant universities, teaching, research, and extension agencies will play an important role in seeing that the human beings on the planet earth are better fed, better clothed and better housed as the 20th century draws to a close and the 21st century begins.

Bill Humphries

Development of the poultry industry has been a major success story for North Carolina agriculture over the past 30 years. 1983 income from turkeys, broilers, and eggs came to $874 million.



THE TANGLE OF POLICIES

Agricultural policy in the United States is a tangle of concepts, objectives and programs. In the last 200 years many programs have been tried, many abandoned, and many more advocated by one group or another. From the history of this great variety of policies and programs, several themes can be distinguished and used to analyze the present and probable future of government policy toward farmers and farming. Most policies can be classified by six objectives:

- To spread ownership of farms among many people
- To educate farmers and conduct agricultural research
- To maintain competitive market conditions
- To protect and develop natural resources
- To stabilize farm income
- To reduce risk and income variability

Impact of Past Policies

It is difficult to measure the precise impact of past policies, but some general results can be identified.

Widespread ownership of farm land resulted from the homesteading legislation and the sale of public domains more than a century ago. The credit programs of the last 50 years—Farm Credit System, Farmers Home Administration and others—continue that emphasis.

As a result of these deliberate policy decisions, U.S. agriculture is composed of a large number of farm production, supply, and processing firms functioning in an actively competitive fashion. Farm resources are still widely owned despite the great decline in the number of farmers. The Founding Fathers would be pleased to find a farm sector made up of well educated, independent capitalists, a far cry from the landless peasant class that they feared might develop in the U.S. as it had in Europe. The Homestead Act and anti-trust policies worked with other market forces to produce a competitive and efficient agricultural sector.

Public research and education were undertaken to develop a progressive and productive agriculture. The land grant university system, begun in 1862 and broadened in 1890 together with the Experiment Stations (1887) and the Extension Service (1914), continues to provide a system of agricultural instruction, research and extension that has become the model for the rest of the world.

American agriculture has been transformed in almost every generation by the application of research results. New techniques, machines, varieties and pesticides have made it possible for U.S. farmers to increase yields tremendously.

The two keys to the general farm prosperity of the past 50 years have been: (1) the ability of many farm households to combine farm and nonfarm employment, and (2) rapid and widespread adoption of new cultivars, pesticides and techniques.

Protection and development of natural resources was a key concept in the funding of large scale irrigation projects beginning in the last century and intensifying with soil conservation programs in the 1930s. Federally funded irrigation programs which opened thousands of acres in the West to cultivation were largely responsible for a decline in cotton acreage in the Southeast.

Measures to enhance and conserve the natural resource base have been only moderately successful. Often, payments made to farmers in the name of conservation, such as those for liming, drainage and irrigation facilities, have subsidized the use of conventional resources and accelerated resource use. Support for true conservation activities has not often focused on the areas of serious soil losses, although there is currently some movement toward more selective and specific assistance programs. Society's long term interest in clean air, clean water and soil conservation will probably dominate policy objectives in this area, occasionally running counter to farmers' interests in increasing their incomes.

Maintaining competitive market conditions for farmers in buying inputs, transporting goods and marketing products was a major theme of farm policy from the 1890s through the 1920s. Legislation to support antitrust activity and to stimulate the development of cooperatives resulted from this policy concern. These policies have been successful: most farm-related markets are basically competitive.

The protection of farm income during periods of low demand has been the primary focus of farm policy in the past 50 years. For some commodities, such as wheat and feed grains, minimum prices have been set. For others, such as peanuts and tobacco, output has been restricted through acreage allotments, marketing quotas, and quality or grade standards. Such programs have had only mixed success.

From time to time, when support prices have exceeded market prices and production has not been controlled, storage stocks of the major field crops have mounted. Although most surpluses of wheat and corn have been absorbed in the past by the outbreak of war or foreign crop failures, the long-run solution has been to lower price supports in real terms and take advantage of expanding international markets. The average size of producing units in these commodities is now so large that there is little sympathy in urban areas for large annual Treasury outlays to maintain farm incomes with such programs.

To exert much influence. . . farmers will need to become very politically astute.

Efforts to reduce production through landbanks in the 1950's, set aside diversions in the 1960's, and the payment-in-kind (PIK) program of 1983, were designed to maintain price by restricting supply. The PIK program had the additional objectives of reducing stocks of surplus commodities and providing a breathing space for those producers who had accumulated enormous credit obligations. Rises in feed grain prices have, in turn, created severe problems for poultry and livestock producers who purchase the grain.

In the case of tobacco, a marketing quota crop, export markets have gradually been lost and storage stocks and U. S. imports have jumped in response to high price supports. Current legislation is designed to lower price supports, win back both domestic and export markets, and allow U.S. production to expand. It is possible that tobacco producers will benefit from lower prices just as wheat and feed grain producers have.

Milk policy is also changing. After three years of political debate, a new program is in place which features reduced producer prices and compensated production diversion.

As important as such commodity programs have been in the past, they are unlikely to be politically acceptable in the future without major modifications.

Reduction of risk is another policy theme evident in federally subsidized crop insurance and emergency program loans and grants. As a result of high costs and occasional abuse of disaster payment programs in the 1970s, federal crop insurance programs have been revised and expanded. It is not yet clear that participation in the subsidized crop insurance program will be large enough to reduce uncertainty materially.

Farmers not only face risk of crop loss from natural causes, they also face uncertainty of market demand, particularly in foreign markets. With the production of almost one acre in every three going to export trade, U. S. agriculture has become very dependent on conditions beyond its control. Foreign demand varies with world weather conditions, foreign farm policies, and relative strength of the U.S. dollar. This is clearly an area of potentially great public attention.

Future Farm Policy

New farm legislation for wheat and feed grains will be enacted in 1985. Changes in existing milk and tobacco legislation will be required in the future, if not in 1985. How much political influence will producers and their organizations have now that they are such a small percentage of the total population?

Certainly, producers and their organizations will find that they have less political power in the future than they have had in the past, but that does not mean that they will be totally without influence. Producers may find a community of interest with farm suppliers and commodity processing groups. Specialized commodity organizations have emerged along side of general farm organizations. Farmers may find that they are more powerful than their voting numbers would indicate. Their elected representatives will focus interest on specific pieces of legislation and be in a position to swap support with consumer and other non-farm interests.

To exert much influence in the late 1980s and the 1990s, farmers will need to become very politically astute. They will need to identify those problems which affect the largest number of producers and focus on those, leaving aside other problems. They need to become well informed about the effects various past policies and programs have had so that they can give future support to policies and programs likely to be most effective in meeting their needs at an acceptable cost to society.

Dale M. Hoover
David L. Kendall

MARKETS: GETTING HARDER TO FIND

For the next twenty years, domestic demand for agricultural products will grow very little. There will be an increase in the average age of the U. S. population, but not much population growth, so that overall consumption of food and fiber is not expected to increase. Although per capita income will increase, it will have little effect on the total quantity of food and fiber consumed within the U.S.

Changing Patterns

In spite of this gloomy prospect for domestic demand, there will still be opportunities for increased production and sale of North Carolina agricultural products. Changes in family life styles and in food marketing and processing technology have changed the mix of farm products consumed in the past, and similar changes can be expected in the future even though prediction of the nature and effects of such changes is virtually impossible. Producers prepared to take advantage of changing patterns of demand will be successful in expanding output profitability.

North Carolina producers will have other opportunities to compete with other regions for a larger share of the market by producing quality products at attractive prices. This has been a very successful strategy for some products over the past twenty years (Table 1). North Carolina's ability to repeat these successes depends on favorable research discoveries by public and private agencies, and on the entrepreneurial vigor of producers and marketers in exploiting new opportunities.

Export Markets Uncertain

In contrast to the limited opportunities for change in demand for food in the domestic market, the international market will provide possiblities for both increases and decreases in demand over the next twenty years. The great expansion of U. S. agriculture during the 1970's was fueled by increased export demand.
U. S. agricultural exports during this period grew at an annual rate of about 20 percent, and by 1981 had reached well over $40 billion, about six times the level of the early 70's. Combined exports of all U.S. agricultural products in 1981 accounted for over 30 percent of total farm cash receipts, and provided a market for one of every three acres harvested in the U.S. The effect of this export bonanza on North Carolina agriculture is indicated by the nearly three-fold increase in the value of North Carolina exports (Table 2.)

The decade of trade expansion came to an abrupt end in 1982. In considering the future of international demand for North Carolina products, it is important to understand the reasons for the trade surge in the 70's, the reversal of that trend in the early 80's, and the factors which cloud the opportunities for further increases in trade in the future.

The unprecedented growth in exports came primarily from two sources. One was the movement of the centrally planned economies from a position of

Table 1. Increases in North Carolina's Share of U.S. Production

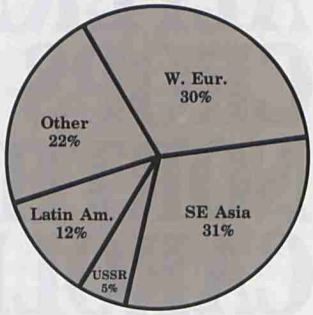
	1960	1970	1980
	%	%	%
Sweet Potatoes	10.4 (2)*	27.8 (1)	38.9 (1)
Cucumbers (processing)	9.9 (3)	11.7 (2)	14.5 (2)
Turkeys	2.3 (12)	10.5 (3)	12.9 (1)
Broilers	8.5 (4)	10.5 (4)	10.2 (4)
Hogs	2.1 (12)	3.1 (11)	3.6 (7)

*N. C. rank among the states

Table 2. Value of Selected North Carolina Agriculture Exports 1972 and 1982

Products	1972	1982	Change
	(million dollars)		
Tobacco	$302.0	$714.2	+412.2
Wheat	7.5	57.8	+ 50.3
Feedgrains	19.0	131.2	+112.2
Cotton	7.4	14.4	+ 7.0
Soybeans	38.5	194.9	+156.4
Peanut and oil	--	34.7	+ 34.7
Poultry	6.0	48.9	+ 42.9
Other	39.7	42.3	33.9
TOTAL	420.1	1,247.4	+827.3

Figure 1. Distribution of U.S. Agricultural exports — 1982.



no net imports to that of net importers of significant quantities of grains, soybeans, meat and dairy products. The second growth area in import demand was in the middle-income developing countries. Figure 1 shows the distribution of exports by trade areas that resulted from these changes.

The reversal of the upward trend in exports can be explained in part by an accumulated increase in world agricultural production. However, the sharp change in direction of the export trend was the result of world recession which hit with full force in 1982, the strengthened U.S. dollar, and the associated credit crunch. The recession reduced the foreign exchange earnings of our customers, and the increase in real interest rates which occurred at the same time increased the amount of that foreign exchange which had to be set aside for debt service, reducing even further the amount available for importing our products. The increase in the value of the U.S. dollar which occurred simultaneously had the effect of increasing the price of our goods to foreign consumers relative to the price paid in the late 1970's. All of these efforts occurring together produced a sharp break in the export trend that had been established in the 1970's.

Trade Policies

It seems very likely that the world recession will be a relatively short one and that economic growth will return, bringing with it the potential for growth in demand for U.S. agricultural products. Whether this potential will be realized, however, depends a great deal on the trade policies that the U.S. and other countries adopt. The potential advantages of free trade are well known, and for two decades world trade negotiations have been directed toward reducing trade barriers. But in recent months these negotiations have not gone well, as several countries, including our own, have attempted to protect domestic producers of import goods in the face of the recession which these countries have shared. Two of the remaining major trade barriers affecting North Carolina agriculture are: 1) the European community's high internal prices for grain, dairy and poultry products and the import levies that are used to maintain them, and 2) Japanese and European quotas and other restrictions on U.S. agricultural products.

The path to freer trade is a difficult one. . .

The path to freer trade is a difficult one because every nation wishes to have no trade barriers affecting its own exports, but perceives internal pressures to errect barriers against the exports of others. U. S. agriculture is a good case in point. Grain, soybean and cotton producers want freer markets since these are export crops. Dairy, livestock and sugar producers want tighter controls on imports of these products. Flue-cured tobacco producers are in an ambivalent position. With a long-standing export product, producers are interested in freer trade, but with increasing imports of both burley and flue-cured, import curbs are being viewed sympathetically.

Elimination of remaining trade barriers could substantially increase the total demand for some North Carolina agricultural products over the next twenty years, but it will be difficult to achieve. These barriers are both the result of and a cause of domestic agricultural policy in both the U.S. and other countries. Negotiating trade policy means negotiating domestic agricultural policy and often industrial policy as well. Since these policies are complex political issues, it seems likely that remnants of trade barriers will be with us into the nineties.

T. Everett Nichols, Jr.
Paul R. Johnson

ALTERNATIVE CROPS FOR NORTH CAROLINA FARMERS?

Producing alternative crops such as sunflower will be easier for North Carolina farmers than developing markets for new commodities.

North Carolina, with its varied climate, its long growing season, and its many types of soils could become a producer of many different crops in the next decade. However, although new crops could be grown here, a distinction must be made between the ability to grow a crop and the development of an efficient and effective system for producing a quality marketable product of economic value to the producer.

New or alternate crops are usually grown to increase profit potential, to spread risks, to improve cropping systems, to be efficient in the use of labor and machinery, and to benefit cash flow. The alternate crop is substituted for a crop that is not doing well in the cropping system.

To a great extent, the soils on a farm determine the yield potential of that farm. Any new or alternate crop must be chosen to match the farm's soil and water potential.

New crops can be classified into two general groups: large-acreage field crops and small-acreage herb, vegetable and speciality crops. Each has special problems to be solved in order to produce and market high quality products.

Large Acreage Field Crops

Grain sorghum and sunflower fit into this category. Costs of production are low, markets are available state-wide, and research data for producing the crops are available. However, the returns from these crops are not much better than those from corn, soybeans, and small grains. They may even be lower. These two crops can be grown alone or after small grain, which could mean a higher income from each acre of land farmed. Both crops do best on better North Carolina soils, but can withstand slightly more drought stress without loss of yield than corn. A few of the crops which could be grown on a larger scale in North Carolina are discussed below.

Grain sorghum will become an important crop of the future in North Carolina because of its adaptability, and the development of new varieties, and better production practices. It can be planted as a second crop behind small grains in addition to being planted as a main crop. Sorghum does better than corn on sandier soils. Although the cost of producing sorghum is less than corn, prices are often lower at market. Grain sorghum prices should be the equivalent of 90

percent or more of the going market price for corn because the grain is from 95 to 100 percent the value of corn for feed.

Sunflowers have been grown commercially in the past with mixed success. The seed can be used for the oil trade as well as the edible seed trade. Many companies are interested in marketing the edible seed. Stability of the market is guaranteed because a contract is given on the price a farmer is to receive for the crop at harvest. As farmers plant sunflowers on their better soils, yields will be higher and returns per acre will increase.

Several processing plants in North Carolina buy large quantities of **dry beans** for canning. Small whites, Navy, Great Northern, Pinto, Kidney, Black Turtle Soup, Cranberry, and Red Mexican are just a few of the many kinds of beans brought here from states to the north and west. Some of these varieties could be produced successfully in North Carolina with both early and late plantings. Product quality is of primary importance, so the drier harvest weather of October shows more promise than a July harvest date. Total state production potential could be one to two thousand acres, with return per acre somewhat greater than standard corn and soybean returns.

Kenaf, a fiber crop that can be grown to produce fine quality papers, has been grown in the Tidewater under contract. The farmers liked it, but the purchasing company has to decide between kenaf and flax as a raw material before acreage will again be contracted. The fiber can also be used for newspaper pulp, but whether this industry is willing to pay enough for the farmer to make a profit is questionable at this time.

Small-acreage Vegetable, Herb and Speciality Crops

Just a few acres of each of many vegetable, herb and speciality crops could satisfy the demand for these crops. A sizable acreage of these many crops could, however, add to the diversity of our cropping system, especially for the small farms of our state.

North Carolina could become a supplier of a large number of **fresh vegetables** such as broccoli, cauliflower, beets, radishes, carrots, and asparagus. These crops are presently being grown on a limited scale. They require intensive management and the costs of production are high, but the returns can also be high if the market can be stabilized. This will mean that a buyer can count on a continuing supply of a quality product. Extensive research is continuing to supply information on the growing of these crops.

The demand is great for a number of **herbs and roots** growing wild in the fields and forests of North Carolina. The potential acres for any one crop may be small, but the number of crops is large and they could become important income generators for small farms. One pharmaceutical company buys over forty plant species. These plants presently grow in the wild and information is needed on how to grow them commercially.

For many specialty crops, prices are extremely sensitive to total supply levels.

Although not an herb, syrup sorghum could be grown on a small acreage. It is labor intensive, but good per acre returns are possible using inexpensive family labor. Processing can promote cooperative community spirit. Research is continuing on the mechanization of harvesting of this crop.

Ginseng is a perennial herb that grows wild in the North Carolina mountains. The plant may also be grown in the shade of lath houses or trees. The large, fleshy roots are dug in the autumn of the fourth or fifth year and bring high prices from buyers.

Catnip is a perennial crop presently cultivated on small acreages in many parts of the state. It is sold for cats and tea, and per acre returns may equal those from tobacco.

The leaves from **sumac** contain tannin. This is a crop which may someday be grown commercially for the brewing industry or as a biomass crop for energy related companies.

Many other plants might be considered for commerical exploitation. Deer tongue, used as a coolant and flavorant in tobacco products, is found in the coastal areas. Passion flower, used in sedatives, is found as a weed and could be grown for its leaves and its fruit.

Black cohosh, wax myrtle, may apple, comfrey and other crops plants are being evaluated for growth and adaptability of field production. It is also known that some plants such as guar, jojoba, and guayle, which are adapted to the drier areas of the western U.S., are not adapted to the southeast because of the high humidity. These crops become heavily diseased and will often die before reaching maturity.

Economic Evaluation of Alternate Crop Marketing

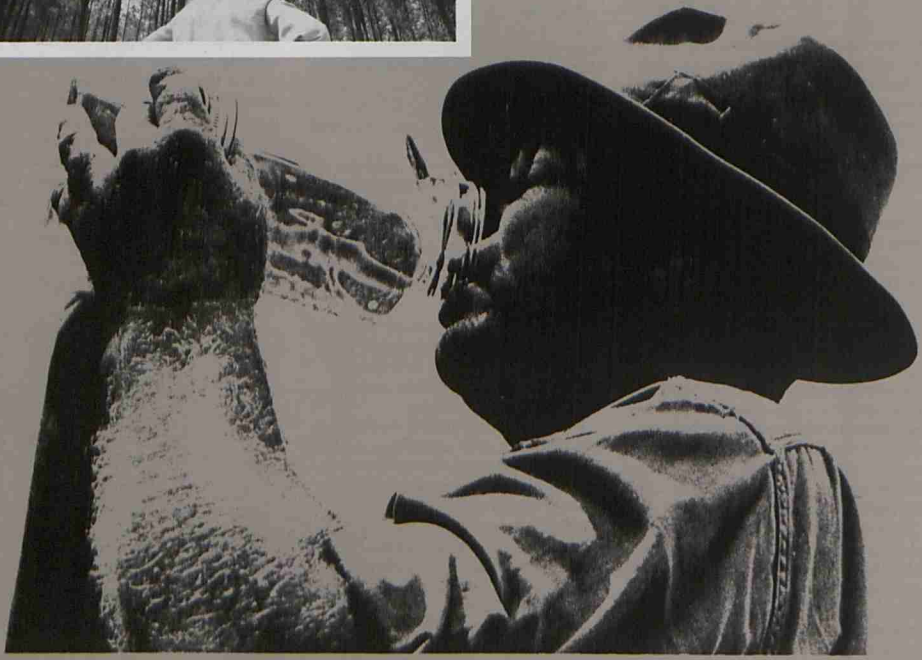
One conclusion from the preceding discussion is that North Carolina growers and researchers currently possess the resources, technical capability and knowledge to produce much larger supplies of specialty corps in future years. In contrast, the marketing potential for many new crops is much more uncertain. Frequently, the availability of substitute products and the tendency for buyer tastes and preferences to change slowly result in low consumption levels and fewer buyers bidding to purchase the products. The relative leanness in markets can lead to market access difficulties for new growers and fluctuating prices for all producers. For many specialty crops, prices are extremely sensitive to total supply levels, with a 10 percent increase in production usually resulting in at least a 20 percent drop in grower price. Price and income volatility considerations suggest that changes in production levels must be deliberate and balanced with changes in consumption levels. Thus, production and sales opportunities for specialty crops are likely to increase in the near future, but marketing considerations will preclude any large acreage increases.

E. A. Estes
W. T. Fike

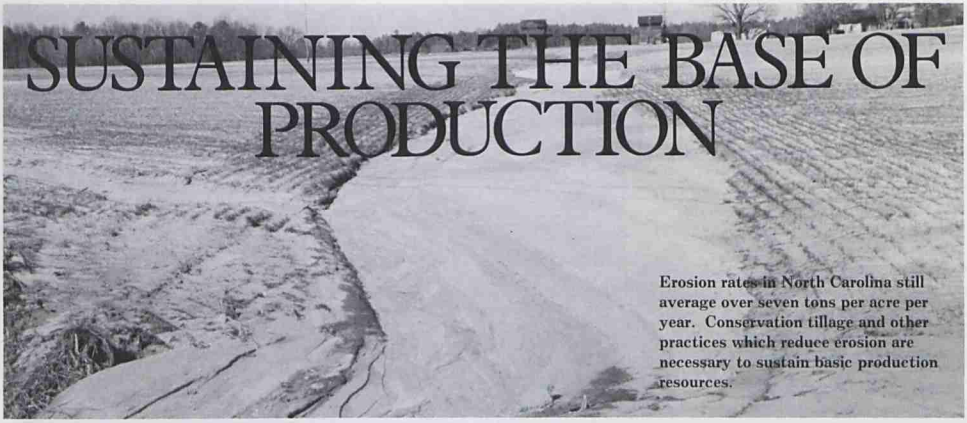
NORTH CAROLINA'S NATURAL RESOURCES

Some things never change: agricultural productivity remains dependent on the quality of the natural resource base. Adequate water and fertile soil are fundamental to the success of American agriculture. Although scientific progress may temper the adverse effects of certain environmental conditions, soil and water, pests and weather will probably continue to set limits to productivity.

Although soil and water may come to mind first when natural resources are under discussion, maintaining air quality, managing hazardous wastes, and finding ways to coexist with wildlife are also important to the quality of life which we value in North Carolina.



SUSTAINING THE BASE OF PRODUCTION



Erosion rates in North Carolina still average over seven tons per acre per year. Conservation tillage and other practices which reduce erosion are necessary to sustain basic production resources.

Much of the true wealth of North Carolina lies in its soil and water resources. The relatively high quality of these natural resources is reflected in our productive agriculture, forestry, fisheries and abundant wildlife. In recent years, the public has put increasing value on these resources, not just for their production potential, but for their less tangible "quality of life" values which contribute so much to the attraction of life in North Carolina.

While N. C. has enough soil, and usually enough water, to grow all the food and fiber that we need, we know that these resources have limits, that many are finite and vulnerable. As the state's population increases and construction and industrial growth continue, North Carolina's natural resources will come under increasing pressure from many directions.

There are problems to be solved in water quantity and quality, in soil erosion, in preserving estuarine nursery areas and wildlife habitat, in disposing of hazardous waste, and in evaluating the impact of atmospheric deposition. With increasing demands placed on our resources, pressure will grow to evaluate the effects that a particular use will have on other enterprises.

As we look ahead, we expect to see increasing use of management strategies which will enable North Carolina to maintain the quality of its natural resources. We are likely to see wider implementation of policies which promote the use of agricultural and forestry practices for the production of food and fiber in ways that improve the soil, conserve water resources, and protect the biological diversity and health of our ecosystems. We are also likely to see growing demands for further research to develop ecologically sound practices for all enterprises involving use of the state's natural resources.

Soil

The croplands of North Carolina will remain at the base of our agricultural productivity. Despite considerable public attention given to the conversion of cropland to other uses, the actual decrease in North Carolina's croplands has been approximately one-half of one percent per year. Between 1967 and 1975, about 128,000 acres were converted from agriculture to other uses. Of the potential farmland base of 11.5 million acres, only approximately 6.2 million is currently cropped.

Potentially more serious than conversion of croplands to other uses is the degradation of croplands by erosion. Topsoil losses of approximately 7.5 tons per acre per year are average for N.C. Losses of this size will alter soil properties such as tilth and fertility and diminish water-holding capacity. Runoff from eroding agricultural lands contributes excessive silt and nutrients to the receiving waters. Although studies to quantify the effects of erosion on yields are underway, a variety of known practices can be implemented immediately to reduce soil erosion and off-site effects.

Appropriate tillage practices, including conservation tillage and terracing, waterway buffers, improved waste management systems and irrigation scheduling are all features of best management practices (BMP). Over the long term, BMP have both economic and environmental benefits as demonstrated by a continuing research project carried out by NCSU agricultural engineers (see table).

Water

Adequate supplies of high quality water will play a crucial role in North Carolina's future productivity and quality of life. Abundant as our water resources may seem today, withdrawals in some areas are nearing capacity use, and within the next decades all resources, both surface and

Table 1. 1982 Losses to Runoff from BMP Farm and Control

	Control Farm	BMP Farm
Water (inches)	6.51	3.45
Sediment (tons/acre)	14.7	0.05
Total Nitrogen (lb/acre)	38.2	7.8
Total Phosphorus (lb/acre)	12.6	2.4

ground, may approach maximum utilization. Before the end of the century, agricultural users will find themselves in competition with other water users so that devising equitable and efficient ways to allocate water among potential users will have become an urgent issue.

Lasting solutions to problems of allocation in the coming era of water limitations will come not only from technical improvements in efficiency of use and recycling, but also from recognition of the full economic value of water and fundamental changes in attitudes and policies which govern water use. In place of unrestricted withdrawals, and even unmetered use in some municipalities we can expect to see some effort to control allocation through market prices or user fees.

Agricultural users have an enormous stake in the economics and regulation of water allocation. Agriculture is a major user of water in North Carolina, and it is also a user whose demands cannot be postponed. Under current North Carolina laws restricting use of surface and ground waters to the lands from which they come, water is not a freely marketable resource. Legal and economic consequences of changes in water law and policy will have significant impact on agricultural users. Water use can be expected to become relatively more expensive as policy begins to reflect more accurately the cost of supplying additional units. Users will probably begin to bear more of the cost of maintaining quality in the water they use and return to rivers and streams.

Flat lands of eastern North Carolina must be drained for agricultural use. Inflatable dam controls water level in drainage channel, conserving water for later use, slowing runoff, and raising water table under adjacent fields. Field tests have shown significant yield increases with controlled drainage systems.

In the years to come, we can expect to see more efforts to improve the efficiency of agricultural water use and to control off-site effects. Monitoring soil water conditions, relative humidity and other factors affecting plant water needs will make irrigation more efficient. Improved water management practices based on better understanding of soil-water relationships are being developed in cooperative programs between NCSU and USDA-SCS and will soon move from demonstration to wider implementation.

Drainage of land for agriculture in the Coastal area of North Carolina has received much public attention in the past few years. The primary concern with regard to potential effects of land drainage on water quality is freshwater intrusion into estuarine nursery areas and contribution of nutrients to algae blooms.

Investigations are underway to determine what inputs from agricultural practices actually reach the estuaries and to assess effects this may have on organisms living in the estuaries.

Research is also being conducted to determine the effects of different combinations of surface and subsurface drainage on water quality and times of flow. With this information, engineers can design drainage systems which will satisfy the drainage requirements for agriculture and minimize off-site effects. All of this information is essential to wise decisions regarding resource management.

Single-purpose drainage systems for removal of excess water could be replaced with reversible subirrigation systems or total water table control on a watershed scale. Such management systems could reduce the sudden influx of fresh water into estuarine nursery areas and conserve water for later use during periods of drought.

As relationships between water quality and fish and shellfish production are clarified, strategies and policies to foster the productive coexistence of agriculture, forestry, fisheries and wildlife will be developed and implemented.

Contributors include J.A. Phillips, E.D. Seneca, J.E. Easley, Jr., J.W. Gilliam, F.J. Humenik, J.B. Atkins, and R.W. Skaggs.

Nutrients from agricultural lands degrade receiving waters and promote algal blooms. Controlled drainage may cut nutrient outflow by 50 percent.

PROTECTING RESOURCE QUALITY

North Carolina ranks 11th nationally in generation of toxic wastes. Finding appropriate ways to handle such materials so that they do not enter the state's waters or the food chain is a high priority.

Hazardous Wastes

Erosion is not the only threat to North Carolina's natural resources. The state already has a significant inventory of hazardous wastes, and the quantity of such wastes will grow as our industrial base expands. In 1983 alone, approximately three million tons of hazardous waste was produced in North Carolina, putting the state in 11th place nationally in generation of such materials.

Improper disposal of hazardous materials can adversely affect both our surface and ground waters. Without adequate measures for environmentally sound degradation or disposal, North Carolina incurs substantial risks to its ecosystems. Improper disposal of hazardous wastes in sanitary landfills, forests, abandoned quarries, streams or other unapproved sites will ultimately result in adverse environmental impact as these materials enter the soil solution, reach ground waters and streams, and eventually estuaries and the ocean. Contamination of drinking water supplies may occur and concentration of toxic substances in the food chain may take place.

The industries which sustain our economy—agriculture, textiles, pulp and paper mills, chemical processing, primary metal products, electrical machinery, and computer technology—all contribute to the accumulation of such wastes. Solving this problem so that the soil and water resources upon which our agriculture, fisheries and municipalities depend is an urgent item on the state agenda. We must develop ways to decrease the amount of waste generated, increase the proportion which can be recycled, and improve techniques for ultimate degradation or disposal.

Soil scientists, biological and agricultural engineers, microbiologists and researchers in many other disciplines are devoting their efforts to finding solutions to these problems.

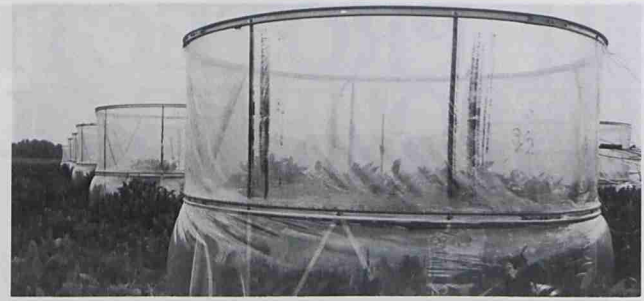
Atmospheric Pollutants

In addition to protecting our soil and water resources from wastes generated in North Carolina, we need to monitor and evaluate the effects of the tons of input from atmospheric deposition. Acid rain is just one of the better

publicized consequences of the combustion of fossil fuels.

Weather patterns carry pollutants from the Midwest and Northeast to North Carolina where sunny days and still air create ideal conditions for production of excessive levels of ozone. Ozone levels in North Carolina are second only to those found in the Los Angeles basin. Sulfur and nitrogen compounds returning to soil, plants, and water as both wet and dry deposition have effects on biological systems which are now beginning to be recognized and studied.

Documented losses in crop yield occur as a result of high ozone levels, and such losses are compounded when ozone occurs in combination with sulfur dioxide and nitrogen dioxide. The National Crop Loss Assessment Network (NCLAN), a federally funded research project located at NCSU, estimates that national 1983 losses to ozone amounted to almost $3 billion in damage to corn, wheat, soybeans and peanuts. In bushels, the yield reduction is about 10 percent in comparison to 1978 figures.



Researchers set estimates of yield reduction losses from ozone and other pollutants at over 10 percent of total harvest value. Plastic field structures confine pollutants so their effects can be measured. Results from North Carolina tests will be compared with results from same procedures in other states.

NCSU scientists have observed a slowing of growth and a decline in reproduction in high elevation forests in western North Carolina. Although causes for the decline in the North Carolina forests have not been pinpointed, change in soil microbial activity and soil nutrient status could contribute. Levels of lead, zinc, cadmium, and copper 25 to 50 times expected levels have been found at high elevations. Such elements are not part of the natural geochemistry in the western mountains, but could have been pulled from the atmosphere.

Changes in surface water chemistry have had adverse effects on fish populations in lakes in eastern Canada and northern New York state. Some North Carolina soils are just as poorly buffered, and changes in acidity could be occurring in North Carolina waters as well.

The average annual pH of precipitation in North Carolina is about 4.6 in the Coastal Plain, 4.4 in the Piedmont and 4.2 in the Mountains. Compared to other areas of the United States, the North Carolina levels are intermediate between the higher acidity levels which prevail in the Northeast and lower levels of the Southwest, but all are now more acid than the 5.6 pH generally used as a standard for normal rainfall.

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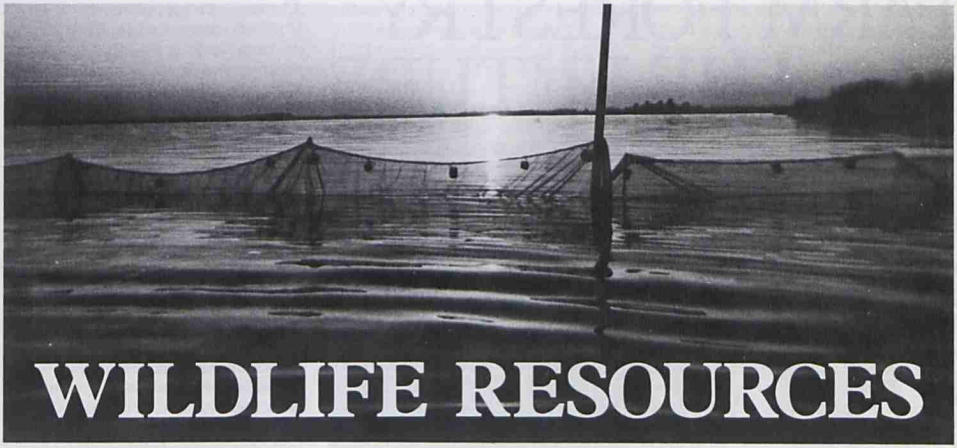
Contributors include E.D. Seneca, J.E. Easley, Jr., J.W. Gilliam, R.I. Bruck, and L.B. Padgett

Trees on high mountains in North Carolina are dying. Plant pathologists are searching for causes of forest decline.



WILDLIFE RESOURCES

Wildlife is a principal component of North Carolina's natural environment. In the past, public interest has centered primarily on game species, but there has been a growing interest in the value of all forms of wildlife. An increased amount of leisure time has also given us more opportunities to enjoy our natural resources.

In the future we can expect to see further reduction of wildlife habitat as the human population increases and growth takes place in previously undeveloped areas. Loss of habitat for wild species will probably continue, and may accelerate, relegating wildlife to the least productive and least valuable lands as various human uses take priority over the needs of wildlife.

As streams flow from watersheds to the sea, many users take the waer they need. Some return all of it, while others return very little. As we move into the next century, a greater out-of-stream demand will be placed on our water resources. In many areas, in-stream flow will dwindle to a point that can no longer support a native fish population or the wetlands habitat associated with certain waters. The natural flow pattern so necessary for back water nurseries and wildlife populations will be altered. Changes in quantity and flow pattern, coupled with an increase in silt, bacteria, pesticides, and nutrient loads are likely to have adverse consequences for our fresh water and marine fisheries.

In addition to possible adverse effects on wildlife from a decline in habitat space and quality, some new problems will emerge. Introduction of exotic species such as hydrilla, asiatic clam and grass carp has already caused problems in some North Carolina waters. Controlling such species and preventing their introduction and spread will continue to be a concern in the decades ahead.

With changes in land use patterns, the human population will come into closer contact with the animal population. As natural food supplies decrease, wild animals will turn to agricultural crops and gardens to survive. The problems which some landowners currently have with deer, beaver and voles are likely to continue and become more serious. Finding acceptable methods for preventing or controlling damage and conflict between North Carolina's human and animal populations will probably require compromise from a number of interested parties.

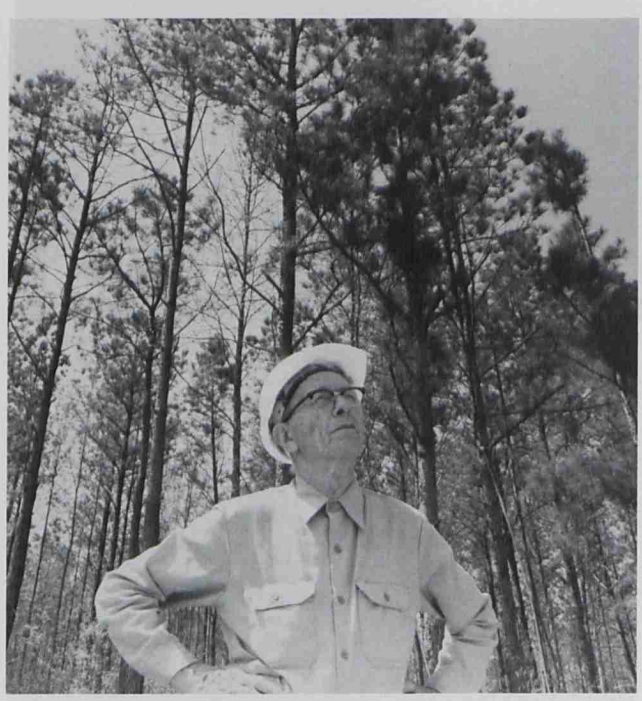
At the same time that human population growth threatens the habitats of many species—both plant and animal—recreational and tourist industries are promoting North Carolina's natural attractions. Finding ways to protect unspoiled areas and take aesthetic values into account on resource use decisions will be a critical issue in the years ahead.

Beginning with their 1983 tax returns, North Carolinians will have the opportunity to check-in for nongame wildlife. This program enables citizens to donate a portion of their tax refund for the management of wildlife that is endangered, threatened, or is not normally considered a game species. The money will help the North Carolina Wildlife Resources Commission in its efforts to aid the threatened loggerhead turtle, to develop educational programs about urban wildlife, and to conduct research on nongame wildlife species.

Gary San Julian

Conflicts between people and animals are likely to become more frequent as wildlife habitat continues to be converted to other uses. Orchard owners and Christmas tree growers may have serious problems with voles (shown here).

FARM FORESTRY FOR THE FUTURE



Farmers own approximately 40 percent of the 20 million acres of forest land in the state, making trees the most widely grown farm "commodity" in North Carolina. With annual sales of over $200,000 million, trees are one of North Carolina's most profitable agricultural commodities. North Carolina's farm forests could, however, produce much more. Current production is less than 50 percent of estimated potential, and only one acre in five is deliberately reforested after timber harvest.

The challenge we face is to develop effective research and extension programs to inform farmers of the benefits of forest management, to develop management techniques economically and technically suited to farm woodlots, and to increase the markets for various forest products so that farm forests are no longer an underutilized resource.

Silviculture

Research on tree improvement, regeneration, soils and tree nutrition, and hydrology provide a broad basis of technology for management of forest lands.

A well managed farm woodlot provides multiple benefits for the owner. Farmers control 40 percent of forest resources in North Carolina, and millions of acres are in need of better management to make the most of this valuable resource.

- **Forest products and wood-based industries contribute about $7 billion annually to North Carolina's economy.**
- **Forest industries are vital to North Carolina's industrial strength, providing over 130,000 jobs and a payroll of $1.4 billion.**
- **Two-thirds of the water used in North Carolina originates in forested watersheds.**
- **Forests provide a multitude of recreational opportunities and extensive wildlife habitat.**
- **Two-thirds of North Carolina, about 20 million acres, is covered with forests.**
- **North Carolina has the largest furniture industry in the U.S. and substantial pulp, paper and lumber industries.**

As a result of past research accomplishments, forest farmers can now plant their woodlots with genetically improved trees of several species, and soil and foliage analyses can provide data for precise prescription for forest fertilization.

Biotechnology research includes programs on mycorrhizal fungi, nitrogen-fixing bacteria, tissue culture and genetic engineering of forest trees. Highly efficient nitrogen-fixing legumes and bacteria have been identified specifically for forest conditions.

Incentives, Regulation, and Economics

Forest landowners have indicated that taxation is the greatest single concern related to incentives for forest management. Numerous favorable pieces of legislation have been enacted

recently in North Carolina and the U.S. Congress to improve the tax benefits to forest landowners. Researchers are studying forest taxation systems and their interpretation by the courts and implementation by tax collection agencies.

Public regulation of land ownership and management directly impacts private nonindustrial forest landowners. With increasing land use pressure, issues of regulation are becoming increasingly important. A research goal is to investigate the biological, economic and legal aspects of rights of ownership and public regulation in the broad arena of multiple use natural resource management.

The State of North Carolina and the U.S. Department of Agriculture offer financial assistance to qualifying landowners for the application of approved management practices on their lands. These programs are successful for those persons who receive benefits, but the proportion who receive benefits is very small in relation to those who should apply management practices on their lands. The goal of this research is to investigate the impact of public financial assistance programs on regeneration and management of existing stands. Agency procedures and policies and landowner attitudes are being investigated to find ways to improve public financial assistance to private nonindustrial owners consistent with the stated goals of these programs.

Market Development

Lack of markets is a major hindrance to management and increased productivity of many farm woodlots. Failure to properly reforest and manage harvested land has produced approximately 7 million acres of commercial forest land in need of improvement—land that is understocked with lowgrade pine or hardwoods. Development of new and improved markets is a high priority for NCSU forest scientists.

Wood as an energy source offers the greatest short-term potential for improved markets. Farmers have renewed the use of wood for tobacco curing and heating greenhouses, poultry and animal houses. Researchers in the Department of Biological and Agricultural Engineering are investigating automated systems for burning wood chips, and wood gasifiers which will allow wood burners to be retrofitted to existing oil and gas fired systems. Other options being studied include the use of wood for production of electricity and firing of internal combustion engines.

Educational programs sponsored by Extension Forest Resources in cooperation with the N. C. Forest Service and Energy Division and the School of Engineering at NCSU led to 30 nonwood-products industries and institutions switching to wood for fuel between 1980 and 1984.

Additional markets being studied by research and extension include use of wood as a feedstock for chemical manufacture and new uses of wood in construction. For example, oriented-stranded boards and other "reconstructed" wood products will convert low quality trees into high quality products by breaking down the wood into particles or flakes and then reassembling them as boards or lumber. Yellow poplar may be used for framing lumber in construction. Export of lumber to Europe and the Far East could be expanded. The southeastern states have the potential to become the wood basket of the world.

Marketing of Forest Products

Forest resource marketing provides revenue to the landowner and may provide incentives for improved forest management practices. Research is concentrated on marketing of mature timber, merchantable intermediate thinnings and non-timber resource values. The research goal is to provide marketing methods by which growers can obtain fair market value for their timber while providing for cost-effective regeneration and management on each acre harvested.

A unique contractual procedure has been developed to improve marketability of chipwood. The landowner may pay for clearing, be paid for timber, exchange the timber for site preparation, or use a combination of these. Results so far include sale of low-grade hardwood not previously marketable, and regeneration of more acres with faster growing, more highly valued species.

Multiple Resource Management

Private landowners usually want more from their forest land than revenues from the sale of timber. Wildlife, forests, and water resources provide for a wide range of recreational activities which may be enjoyed by the landowner or leased to provide revenues. Management strategies are being developed which emphasize one or more resource goals while providing for maintenance of all resource values. Market demand and supply statistics on forest recreation resources are also being developed for North Carolina.

The Extension Forestry program sponsors field days and demonstration tours to show landowners how to improve woodlot management.

Equipment Development

Methods of marketing, harvesting, regenerating and managing private nonindustrial forests are being investigated and extended to forest owners. These include methods of harvesting that reduce the cost of regenerating, harvesting with equipment that can be moved rapidly between small timber tracts at lower cost, and new methods of marketing that can make harvesting small tracts more attractive to timber buyers. Low cost methods of herbicide application, the development of mechanical planters that require less investment in high-cost site preparation, and intermediate thinning of timber stands are being investigated.

"High Tech" Hits the Woodlot

Two major microcomputer applications have been recently developed for the management of farm woodlots. A complete analysis package that allows the forest owner to determine economic returns from timber management for different interest rates, cash flows, and tax treatments is now available. Several commercial and public domain computer mapping software packages are available for resource inventory and productivity analysis. These programs are still being improved but their usefulness has been demonstrated and requests for program copies and information have been numerous.

Natural resource inventory procedures using satellite and high altitude photography are being developed and refined. The potential for producing timely, inexpensive maps of natural phenomena such as insect infestations or pollution damage opens whole new dimensions of resource management opportunities.

Getting Out the Word

Extension is using several approaches to make the landowner more knowledgeable and motivated. Over 60 counties have formed or are planning landowner forestry associations. Extension plays a lead role in the establishment and maintenance of these groups. Women, absentee landowners, and CPAs and tax preparers have been targeted for special forestry programs. Local tours and establishment of demonstrations of good management practices play an important role in motivating the landowner. Also regular media coverage of various aspects of forest management is encouraged.

Industrial, public, and private foresters who offer consulting services to landowners must recommend management practices that are both practical and affordable. The Small Woodlot Research and Development Program has taken the lead in evaluating continuing education needs among professional foresters and in developing methods to train forestry technicians who will become vendors of forestry services to small woodlot owners.

Conclusions

There are many indications that management on farm woodlots is improving and that research and extension make important contributions to these activities. As levels of forest management continue to improve, so will the needs for current, practical, cost-effective and environmentally suitable technology. Continued emphasis on forest research and extension is necessary to assure North Carolina's continued leadership in forestry.

E. C. Franklin
M. P. Levi

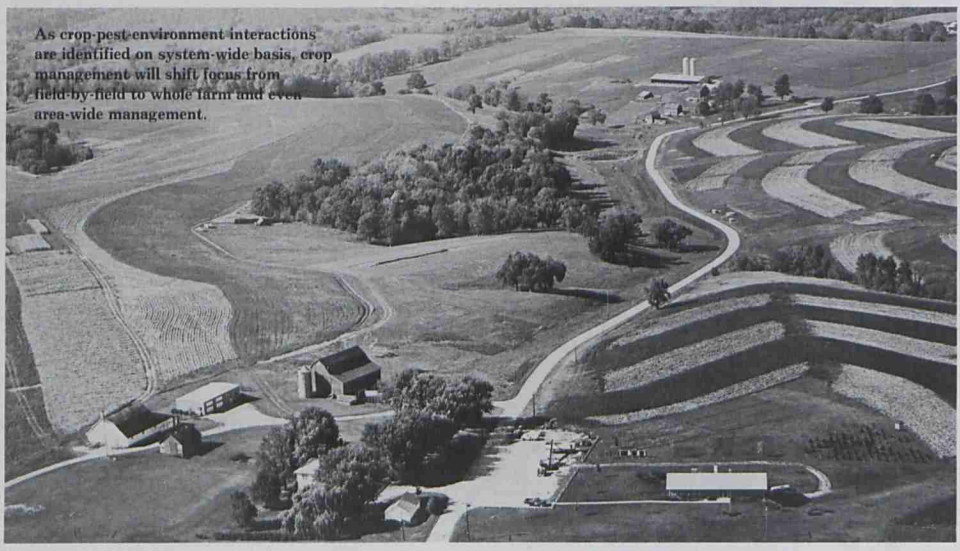
Whole tree chipper and new processing techniques can turn even less valuable species into a usable resource from farm woodlots.

A NEW GENERATION OF SCIENCE

Finding solutions to the problems of tomorrow depends upon replenishing our fund of knowledge through a renewed emphasis on basic science in every department. From agronomy to zoology, scientists are using new technologies to look at the structures, processes, and mechanisms underlying biological systems. Genetic engineering has the potential to alter the characteristics of economically important crop species, improving their productivity, conferring resistance to pests, and eventually improving tolerance to environmental stress.

New management systems will be developed as improved knowledge of biological systems is incorporated into decision-making models. These improved models will begin to make crop management both more rational and more scientific.

OPTIMIZATION OF CROP PRODUCTION SYSTEMS



As crop-pest-environment interactions are identified on system-wide basis, crop management will shift focus from field-by-field to whole farm and even area-wide management.

Crop productivity has increased in the past 50 years mainly through the application of research in classical breeding methods, improved pest control, and more effective management of crop, soil and water resources. Continued improvements in productivity and profit depend upon the development of new technology. In addition, further increases in productivity will probably occur as scientists obtain a more thorough understanding of plant growth and development at the molecular level.

Profitable crop production in the future will depend upon the development of management systems that integrate soil and water management and pest control practices with new technologies, variety selection, and other production strategies. Fundamental to the development of such systems will be the coordination of efforts of scientists from various fields into an integrated, multidisciplinary approach.

Profitable Agriculture

Profitable agriculture depends on three factors: cost of production, yield obtained and effective marketing. Producers need to recognize the cost-effectiveness of various inputs such as fertilizer and pesticides. In order to help growers establish relationships between costs and benefits of various agricultural inputs, researchers are now developing decision-making models.

Computer simulations of cropping systems promise to refine crop production techniques. Such analyses combine information from all pest and crop disciplines. The impact of new technology and information can be quickly assessed by incorporation into such models so that alternative management systems can be evaluated and information made quickly available to growers. Thus the results of many different research directions can be rapidly integrated into practical applications.

Soil and Water Resources

Tillage practices and soil water availability are related. Root development and plant growth are influenced by the physical, chemical and biological properties of soil. Increased productivity will come from better understanding of the interactions of soil nutrients, water supplies, and plant varietal characteristics.

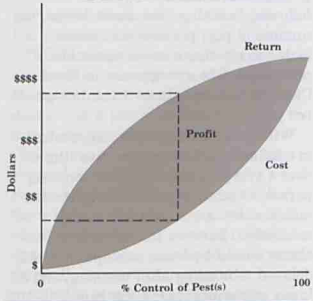
Conservation tillage practices that maintain and improve long-term soil productivity must be more widely implemented. The best possible methods of tillage and residue management and their effects on crop development and pest populations must be identified.

Although conservation tillage leaves more crop residue on the soil surface and thus tends to reduce erosion, it does not entirely solve the problem in sloping fields. Added protection will be obtained through the use of inputs that enhance plant growth, leading to the development of dense canopies and more extensive root systems which

further help to stabilize and improve the soil.

Crop residue left on the surface by conservation tillage practices increases water use efficiency. However, on certain soils and with certain crops, expansion of irrigation capability will be necessary to offset the costly effects of periodic drought. Development of water-conserving irrigation technology and scheduling methods appropriate for various crops and soils will also be necessary. Irrigation scheduling will become more precise when crop water needs can be evaluated in terms of soil water-holding capacity, stage of plant development, and projected transpiration losses.

Cost-Return Relationship for Pest Control



Plant Protection

Insects, diseases, nematodes, and weeds reduce yields by interfering with fundamental plant growth processes. These ever-present pest complexes cause damage throughout the growing season. Current management strategies generally rely on pest-specific control tactics. However, for efficient pest management compatible with modern farm technology, new strategies for simultaneous control of multiple pests are needed.

Pest management strategies must be recognized as an important function of production research and integrated into crop management systems through cooperative, interdisciplinary efforts. The development and application of effective pest management must transcend traditional approaches and geographic limitations. An integrated pest management (IPM) strategy requires an understanding of pest dynamics, economic impact of pests, and interactions within and among different pests.

Knowledge of basic biological processes of system components is required to understand the principles that govern the cause, magnitude and persistence of host-pest interactions. Often, the roles of host resistance, weather, pest variability and other factors are described individually. However, current information on biological events is insufficient to build a systems-level pest management program. This is especially true of soil-borne pests such as nematodes and fungi. Additional supporting research into the role of cultural practices in altering basic pest ecology needs to be incorporated into managment strategies.

Reliance on pesticides for control will be reduced when fundamental understanding of biological processes allows application of biological controls to row crop agriculture. Biological methods offer hope for controlling several pests which cannot now be controlled with currently available chemicals or other means. An aggressive effort is needed to understand the population dynamics of the natural enemies of pest species and to develop procedures to control their damage.

Thresholds and Profitability

The decision to control a pest should be based on the economic threshold which is the level of pest infestation or crop damage at which the potential economic loss exceeds the cost of control. Farmers must contend with infestations that vary in degree and complexity. Rarely is a crop infested by only one species of one type of pest. Most commonly, crops are infested by several types of pests at the same time, and the contribution of complex infestations to the total stress load is still largely undefined.

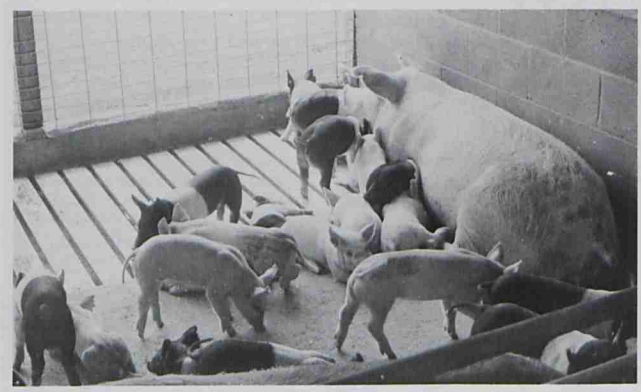
Integrated Crop Management

The success of IPM programs in making pest control decisions on the basis of expected economic return suggests that integrated crop management will become the standard practice of the future. As the findings from more disciplines are integrated into models upon which management decisions can be evaluated, farmers will be able to take greater advantage of the advances rapidly occurring in agricultural sciences.

Contributors included: H. M. Linker, J. R. Anderson, H. D. Coble, R. E. Stinner, and B. E. Caldwell.

Irrigation scheduling will be more precise in the future as relationships among soil, water and plant needs are understood for each crop and soil type.

INTEGRATED REPRODUCTION MANAGEMENT



Profitability depends on high rates of reproduction. Summer infertility lowers productivity of North Carolina sows. Causes for summer infertility are probably complex, depending on interactions of hormones, management, and environment.

Livestock and poultry have become a billion dollar business for North Carolina Agriculture in recent decades. The profit on each chicken, turkey, or hog, however, is small, and success depends on continuous high rates of reproductive efficiency in the breeding herds and flocks. Low reproductive rates limit efficiency and spread costs over too few units of product.

Integrated Reproduction Management (IRM) originated as a means of better utilizing the total research, teaching, extension and industry capacity of the United States to solve complex food animal reproduction problems. IRM aims at improving reproductive performance by identifying the limitations to reproduction and developing strategies or technologies to overcome them. Drawing upon several disciplines and cooperative work among institutions and industry, the IRM approach should lead to an increase in production efficiency.

In North Carolina, IRM efforts focus primarily on poultry and swine reproduction because these are the major food animal species in the state. IRM efforts in beef and dairy cattle and sheep also receive attention through cooperative programs in the southern region. Research conducted under the auspices of IRM will be carried out mainly in commercial herds and flocks in order to identify and solve the reproductive problems limiting production.

Three specific areas of emphasis for IRM research at NCSU have been identified:

- Improve reproductive rates in swine herds during summer months when 15 to 40 percent of the sows weaned fail to cycle immediately.
- Improve rates of turkey egg hatchability.
- Optimize broiler-breeder reproductive performance by successful recycling of hens for a second laying cycle.

IRM Programs in Swine Reproduction

When North Carolina pork producers turned to confinement production, they adopted a rigid schedule in which maximum productivity depends on the prompt return of sows to estrus following weaning. As shown below, the number of pigs per sow is a critical factor in whether a swine operation is profitable. The average sow in North Carolina herds produces 13 to 16 pigs per year.

With good management, sows raised in confinement can produce five litters over a two year period. However, long periods of infertility common in the late summer disrupt orderly production schedules. Summer infertility is characterized by lower conception rates, delayed rebreeding after weaning, and a lower subsequent farrowing rate.

To understand the causes of swine infertility, NCSU researchers are investigating a multitude of biological, environmental and social factors to determine the chain of events which leads to successful reproduction. Nutrition, for example, affects both metabolism and body composition; season of the year makes a difference in photoperiod and temperature; the endocrine system responds to a multitude of signals from both internal and external sources.

Returns ($) to Land, Overhead and Management for a 90-Sow Confinement System*

Pigs per Sow per Year	Price of Market Hogs per CWT		
	$60	$50	$40
20	$ 81,627	$ 41,191	$ 755
18	64,748	28,272	−8,204
16	47,869	15,353	−17,163
14	30,990	2,434	−26,122
12	14,111	−10,485	−35,081

* Source: North Carolina Swine Demonstration Center.

Within the near future, interactions among these factors will probably be understood well enough to allow development of practical strategies for improving fertility. A major thrust of IRM is the educational effort to bring the latest research results to Extension agents, industry personnel, producers, and veterinarians to solve reproductive problems in commercial herds.

Estimated Farm Value of Livestock and Poultry Products Produced in North Carolina, 1983

Product	Value (Millions)
Broilers	$ 483
Hogs & Pigs	361
Turkeys	243
Hatching Eggs	139
Commercial Eggs	96
Retired Breeders & Layers	18
Milk	237
Cattle & Calves	145
TOTAL	$1,722

IRM Programs in Poultry Reproduction

Selective breeding for rapid growth and large size has caused severe reproductive problems in turkeys and broiler hens. Twenty to 35% of all turkey eggs set in commercial hatcheries never hatch. Among nonhatching eggs, nearly 10% are truly infertile, while the rest are embryos which die mainly during the first and last thirds of the incubation period.

NCSU researchers are focusing on the eggshell and its relationship to the exchange of oxygen and carbon dioxide as a probable factor in contributing to embryo death. In the turkey, embryo metabolism has increased so greatly that eggshells really need 300% more surface area than they now have to maintain the same proportions as in wild turkey eggs which hatch at acceptable rates. Because of increased metabolic demand, the domestic turkey embryo apparently fails to obtain the necessary oxygen through its shell at critical growth stages. Low oxygen levels also cause the low levels of thyroid hormones which seem to contribute to death in the latter stages of incubation.

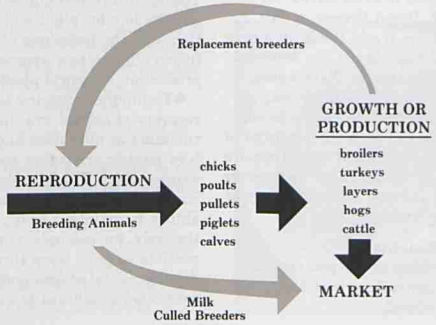
Someday, techniques of genetic engineering may permit direct manipulation of egg size and pore number. In the meantime, however, researchers are looking for management techniques which will improve hatchability. Two approaches aimed at improving gas exchange through the shell are under investigation. The first consists of removing the shell cuticle with a mild base solution in order to dissolve the protein material which normally plugs pores so that gas flow across the shell increases. The second approach manipulates dietary calcium and magnesium in order to investigate the mechanism of pore formation at the time of eggshell calcification. Additional studies with supplemental thyroid hormones are also in progress. Thyroid hormone injections are used to match the eggshell structure and vital gas conductance to see if such manipulations can improve hatchability.

The tremendous expense of hatchability research has limited past studies, but new cooperative agreements with industry will dramatically improve testing programs. About 6000 eggs (at an average cost of $1.00 per egg) are needed for each experimental treatment. With industry providing access to large numbers of eggs, large scale testing of solutions suggested by laboratory studies will be economically possible. Hatched chicks or poults will be handled by the industry through normal channels.

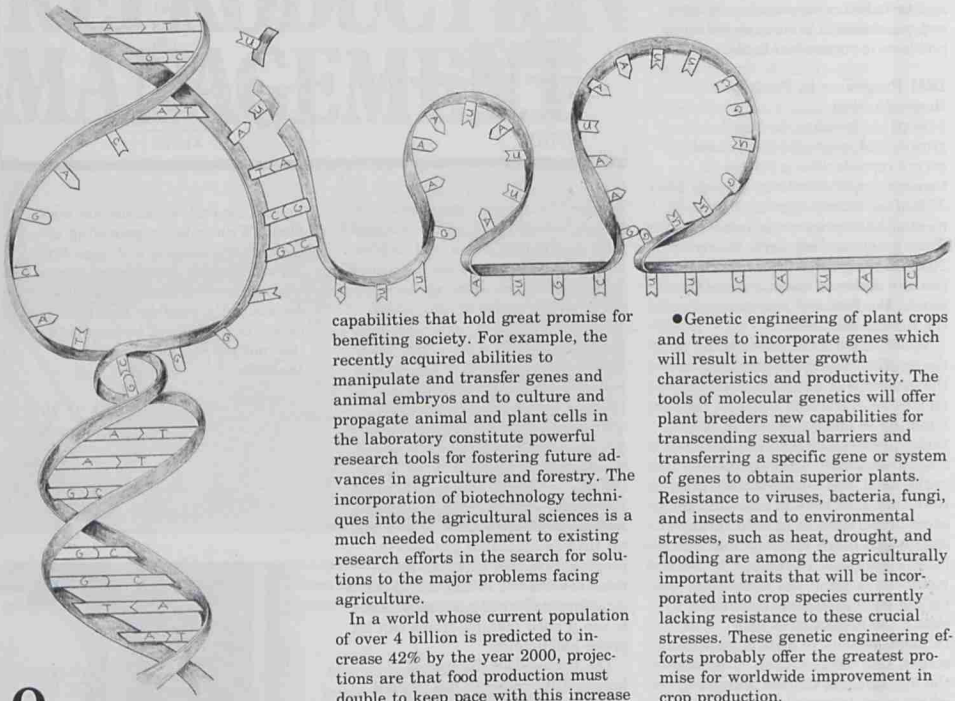
J. H. Britt
V. L. Christensen

Improving hatchability of turkey eggs would be of economic benefit to state's poultry industry. The thousands of eggs necessary for experiments in hatchability are provided by a cooperative agreement with industry.

LIVESTOCK AND POULTRY PRODUCTION



BIOTECHNOLOGY



On November 8, 1983, Chancellor Poulton announced the establishment of a university-wide biotechnology program for North Carolina State University. With the announcement, NCSU dedicated itself to a major research and educational effort in biotechnology, with the goal of attaining a leadership role in the agricultural sciences, forestry, veterinary medicine, and engineering. Thus, as NCSU approaches its centennial year and plans for its second 100 years, the biotechnology program is viewed as a development that will earn North Carolina State University and North Carolina a leading position in biotechnology in the nation.

Biotechnology, which encompasses a wide range of biological methods developed within the past two decades, is rapidly revolutionizing the capabilities of the biological sciences — capabilities that hold great promise for benefiting society. For example, the recently acquired abilities to manipulate and transfer genes and animal embryos and to culture and propagate animal and plant cells in the laboratory constitute powerful research tools for fostering future advances in agriculture and forestry. The incorporation of biotechnology techniques into the agricultural sciences is a much needed complement to existing research efforts in the search for solutions to the major problems facing agriculture.

In a world whose current population of over 4 billion is predicted to increase 42% by the year 2000, projections are that food production must double to keep pace with this increase in population. Although some of the increased food production will come through increased efficiency from application of current technology, new approaches in agricultural research are needed if this impending problem of food production is to be solved. As stated by W. David Hooper, a vice president of the World Bank, in a symposium held last May at the National Academy of Science in Washington, D.C. "In the twenty-to-thirty-year perspective, we will be unable to support food demand from the potential of traditional research and infrastructure improvement. We must get back to the biological materials." Biotechnology offers this opportunity.

Potential Benefits

What are some of the potential benefits to agriculture that biotechnology offers?

- Genetic engineering of plant crops and trees to incorporate genes which will result in better growth characteristics and productivity. The tools of molecular genetics will offer plant breeders new capabilities for transcending sexual barriers and transferring a specific gene or system of genes to obtain superior plants. Resistance to viruses, bacteria, fungi, and insects and to environmental stresses, such as heat, drought, and flooding are among the agriculturally important traits that will be incorporated into crop species currently lacking resistance to these crucial stresses. These genetic engineering efforts probably offer the greatest promise for worldwide improvement in crop production.
- Regeneration of whole plants from individual cells and manipulation of plant embryos offer major promise for isolating unique genetic materials and for selecting plant lines resistant to environmental and biological stresses. Tissue culture techniques will also be used widely for plant and tree propagation, and the technique of protoplast fusion offers a new approach for the production of hybrid plants.
- Techniques allowing for the recovery of animal ova, in vitro fertilization or alteration and return to host mother are potent reseach advances which will be widely incorporated into animal research. The ability to maintain embryos outside the body, for example, now makes it possible to grow them through several developmental stages under various controlled conditions to study their

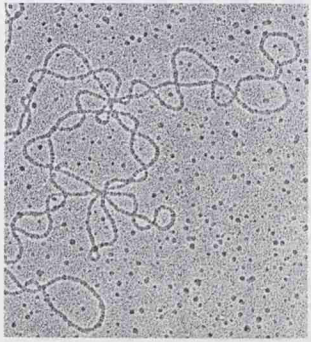
development. Studies of environmental conditions affecting embryonic development will furnish information directly applicable to improving animal production.

- Antibodies can now be produced in large amounts by hybridomas (produced from spleen-myeloma cell fusion). The use of these antibodies in basic and applied plant and animal research is almost limitless. Because the antibodies bind to highly specific proteins they are invaluable for isolating and purifying cellular proteins. Of particular importance to the animal industry, such monoclonal antibodies will be widely used for the study, diagnosis, and treatment of animal diseases.
- With the use of recombinant DNA techniques, microorganisms can be used to produce animal hormones in large amounts and at relatively low cost. Use of these hormones for altering animal growth, development, and performance will be of major value in clarifying physiological processes and reproductive functions as well as for commercial purposes. Recombinant DNA techniques will also be used to produce vaccines against animal diseases, significantly improving worldwide animal production.
- Genetic engineering of the microorganisms now used in the fermentation of foods will not only enhance their usefulness, but will also create new capabilities of commercial importance. Major impacts from this technology can be expected in the development of dairy, meat, vegetable, cereal, and food products and also in the beverage and spirits industry.

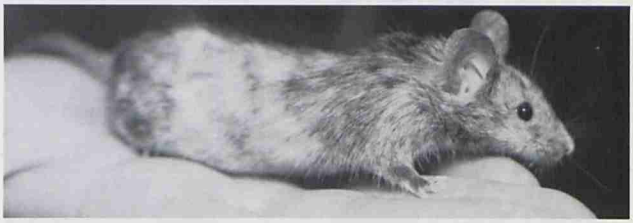
Because of the diverse and important uses envisioned for biotechnology in agriculture, analysts conclude that agricultural applications of biotechnology will prove to be even more critical than those medical applications which have been among the first uses of biotechnology. Analyses by the Policy Research Corporation and The Chicago Group concluded that the applications of biotechnology to agriculture will generate an agribusiness market of $50 billion by the year 2000.

Thus, as a leading participant in the university-wide biotechnology program, the School of Agriculture and Life Sciences champions this new era of agricultural research. The blending of biotechnology with traditional agricultural research offers great promise for the future of worldwide agriculture — a promise that is critically important for the economic and social well being of future generations.

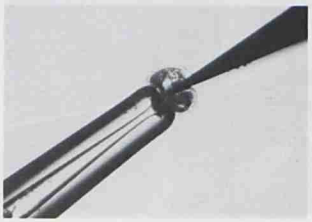
F. B. Armstrong



DNA carries genetic information in all living organisms. As scientists learn how DNA controls the inheritance and expression of various traits, a multitude of agricultural applications will be possible. (Electron micrograph of mitochondrial DNA from corn, courtesy Wilma Hu.)



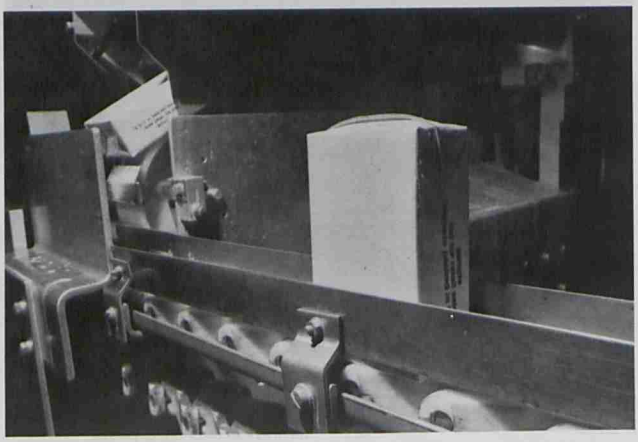
Chimeric mice have four parents, genetic material is mixed in very early developmental stages.



Splitting embryos is just one technique researchers are exploring in searching for ways to improve livestock.

NCSU researchers have grown thousands of loblolly pine seedlings using tissue culture techniques. These methods increase offspring obtained from superior trees and permit early screening for disease.

FOODS FOR THE FUTURE: EMPHASIS ON QUALITY



People are not only eating convenience foods more often these days, but they are expecting more quality from them. Although ease of preparation rates high with consumers, taste and nutritional quality are of equal importance. The current interest in relationship between diet and health has also been an important influence on product development in the food industry over recent years. These trends will probably continue to rate attention throughout the rest of this decade and into the 1990s as the industry looks for ways to satisfy consumer demand.

Translated into research questions, the problems of the future may sound familiar: "Is it safe? Is it nutritious? Is it tasty? Does it store well? Can it be produced and transported and marketed efficiently? Is there a market for it?" Scientists who try to find answers to these questions in the future will be using both basic science and new techniques to address them.

Raw Product Quality

High quality food begins with the plant breeding process and food scientists work with breeders to make sure that nutritional value and processing characteristics of varieties under development will result in a satisfactory product. Peanut oils, for example, vary considerably from variety to variety, and early identification of off-flavors or undesirable characteristics streamlines variety development. Researchers from food science also work with horticulturalists to test muscadine grape varieties for their wine-making characteristics, cucumbers for their pickling potential and sweet potatoes for protein and vitamin content.

The way in which crops are handled during and after harvest may also affect nutritional quality. The harvested produce is not inert, but continues respiration and ripening processes which may adversely affect quality if not controlled.

Storage conditions for sweet potatoes, for example, are very important. When temperature and humidity are properly controlled during the curing process, carotene (vitamin A) content can be maintained and wounds which are suffered heal during the curing process if appropriate conditions are maintained.

The impact of mechanical harvesting or sorting on food quality also needs to be evaluated. NCSU engineers who developed a blueberry sorter to distinguish degrees of ripeness needed advice from food scientists on extent of mechanical damage to the fruit. As mechanical harvesters for more horticultural crops are developed, evaluation of such impacts will be an important cooperative undertaking for food science.

Maintaining Quality During Processing

Underlying almost every research and extension endeavor in the area of food science is the need to maintain the highest possible nutritional value. Development of processing technologies and evaluation of packaging and storage depend upon assessment of their effects on protein, vitamin and mineral content and protection of food from spoilage.

The NCSU Department of Food Science has been closely associated with the development of methods for improving the quality of UHT processed dairy products. Immobilized enzymes are being studied for removing the "cooked" flavor of UHT processed dairy products. The development of aseptic packaging made it possible to package UHT-processed milk with a shelf life of about three months

without refrigeration. With the advances now occurring in processing and packaging technology, shelf life of these non-refrigerated dairy products could be extended to a year.

Immobilized enzymes are also being used in the development of a new method for assessing protein quality. The new technique gives a much more accurate reading of the availability and digestibility of amino acids than previous methods using acid hydrolysis.

Bacteria used in fermentation processes are subject to invasion by virus-like bacteriophages. Since phage-resistant varieties of bacteria have been identified, it may be possible to transfer the mechanism of resistance to the fermentation bacteria and overcome the problems of decline caused by invasion.

Another problem to be overcome by understanding of the basic chemistry and physics of raw materials is equipment "fouling." Processing of many dairy and egg products will be hastened when such problems are solved.

The Chemistry and Physics of Taste and Texture

Acceptance of foods depends as much on texture as it does on taste. A limp potato chip, a rubbery fish stick, and runny tomato paste are all likely to be rejected by consumers. Rheologists, scientists dealing with the deformation and flow of matter, are using instrumentation to analyze the "crunch" and the "mouth feel" of new foods to compare results with evaluations by panelists.

Finding causes for "warmed over" flavor in poultry products, assessing hot-boning of red meats, and preventing softness in pickles are all problems calling for chemical analysis.

As part of the basic research in food science, attention will be directed not only toward the detection of changes in food quality, but also toward development of new and improved ways to assess and measure the subtle chemical changes in foods as they proceed from field to table. Just as enzyme technologies are being used to produce commercial products on a scale not visualized only a few decades ago, the technologies of the future are likely to be equally difficult to predict with much accuracy.

D. R. Lineback,
G. L. Catignani

A CHALLENGE FOR TOXICOLOGY

The challenge for toxicology as we approach the 1990s is to ensure the safe use of chemicals, not only in the production of food and fiber, but in all aspects of our daily lives. As we develop a better understanding of the mechanisms of toxic action, we will be able to design more specific pesticides and devise improved testing techniques.

Many of the agricultural chemicals on the market today were chosen almost at random. If a chemical killed a pest, then it was a pesticide. Present circumstances thus favor the somewhat negative approach of testing chemicals currently in use and then restricting those which pose a potential hazard to human health or the environment. Testing must be done empirically, detecting effects one at a time and evaluating each effect in separate, expensive, and time-consuming feeding trials.

As we learn more about the relationship between chemical structure and biological effects, we will be able to design pesticides which will have cer-

tain, predictable, biological effects on both target and non-target organisms. By the end of the next decade, we should be able to say that a compound with a certain structure will be an effective pesticide, and that it will be a safe pesticide because we can predict the effects of that chemical structure on biological systems.

In the meantime, however, we can expect to see the testing procedures for pesticides get more cumbersome as new tests are added to current ones. Only when confidence in the new systems gets sufficiently high, will we see a growing reliance on analysis of chemical structure to predict biological effects, rather than exhaustive tests to try and uncover effects after a product has been developed and marketed. Evaluation costs are now so high that all but a few companies have been eliminated from the development of pesticides, reducing the number of new compounds which become available each year.

Nature does its part to restrict the use of pesticides, too. The longer a chemical is used, the more members of the target population exhibit resistance to it, and hence its use is no longer very effective.

Studying the Mechanism

Toxic action involves a complex series of events, any of which might be of importance in the regulation and use of the chemical in question. Pesticides may be absorbed through the skin, the digestive tract or lungs and then transported by the blood system to the various organs of the body.

The body can detoxify some chemicals and excrete them. Others may be metabolized to compounds of even greater toxicity. The toxic chemical or its products, either alone or in concert with other chemicals and products, then reacts with the body constituents to bring about the characteristic mode of action. All of these steps are being studied in the Toxicology Program at NCSU.

In such studies it is critical to understand that you not only have to understand the mechanism of pesticide action, but also the mechanism of the interactions of one compound with other and the effects on organisms other than the target organism. That kind of understanding needs to become a part of the design process, otherwise you are likely to have an excellent pesticide which is also toxic to non-target organisms. This is, in fact, what has happened in the past.

In the future, we will see more frequent application of two approaches to toxic action. One will be a biochemical approach. This will be based on knowledge of the organism, its enzyme and organ systems and how they metabolize the compound, and its defense mechanisms and their success. When a compound is toxic to an organism, it is because none of the many defense systems is adequate. This approach will explain exactly what effect a particular compound has upon a particular organism.

The other approach is chemical. It will explain the relationship between the chemical structure of a compound and the biological effect it has.

Only when confidence in the new systems gets sufficiently high, will we see a growing reliance on analysis of chemical structure to predict biological effects.

Interaction Effects

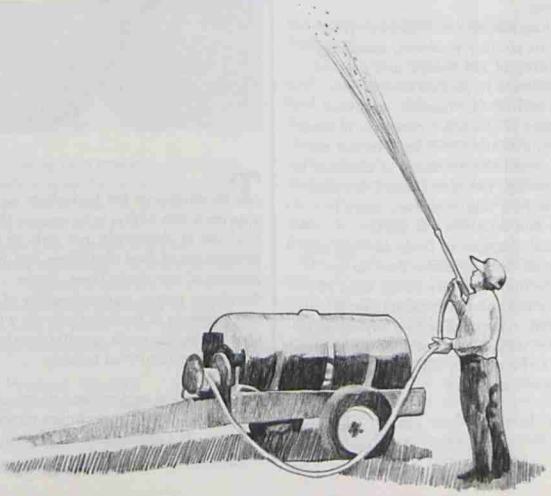
Pesticides not only have directly toxic effects, they may interact with each other or with enzymes in the body to alter the effect of other chemicals. A pesticide, for example, may cause the production of enzymes which metabolize foreign compounds, and these enzymes then alter the effect of other chemicals. The action of both prescription and nonprescription medications can be altered by such exposure. Conversely, taking medication may make an individual more sensitive to the action of another foreign compound.

Chemical interactions may also be synergistic. Combinations of chemicals may prevent the body from breaking down the toxic compound. If the effect takes place in a target organism, synergistic interactions may be valuable. If they take place in man or other non-target organisms, they may be destructive. In both cases such interactions need to be known and predictable.

Streamlined Testing

Work is being done to develop a variety of short-term assays which do not involve life-time feeding trials. As more sophisticated tests are developed we will see a streamlining of the development and evaluation process. We will also be able to say with more confidence that the use of pesticides is compatible with human health and environmental safety.

Ernest Hodgson



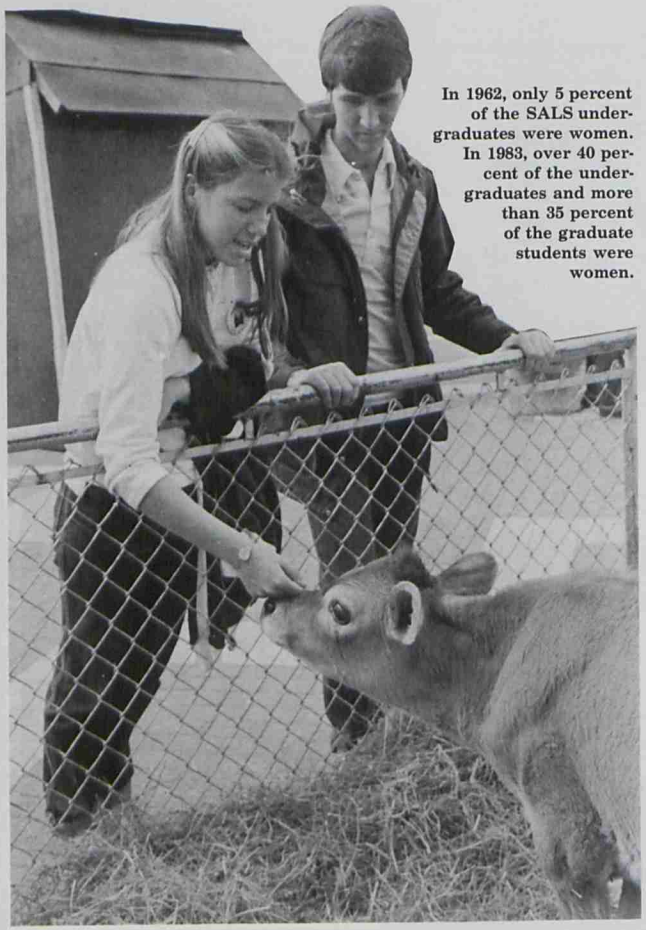
SERVING THE PEOPLE

Although North Carolina depends heavily upon income from the production and processing of food and fiber crops, there are fewer farm families every year. Even with a high percentage of the state's population in rural areas, an increasing distance from production agricultural characterizes the people of our state. This distance has implications for all of the program areas in the School of Agriculture and Life Sciences.

The clientele served by the North Carolina Agricultural Extension Service is becoming increasingly diverse, expanding demands upon the information transfer capability. While continuing to make use of traditional communications channels, Extension specialists are rapidly incorporating new technologies into their communications efforts.

The changes in North Carolina's population are also having an impact on agricultural education. Recruiting of students to fill future positions in agricultural research, industries, teaching, and extension will take more and more effort in the future.

FINDING AGRICULTURAL EXPERTS FOR THE FUTURE



In 1962, only 5 percent of the SALS undergraduates were women. In 1983, over 40 percent of the undergraduates and more than 35 percent of the graduate students were women.

Although modern production agriculture involves a relatively small percentage of the U. S. population, the total agricultural complex of production, processing, transportation, packaging, and marketing contributes about 20 percent of the gross national product and employs more people than any other private enterprise.

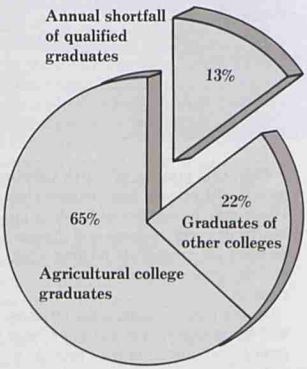
At all levels, this basic industry is likely to face shortages of highly qualified professionals with the education to fill positions as technologists, scientists and managers. Critical shortages in the next 10 to 15 years are projected for graduates with advanced degrees in agricultural sciences.

Several factors contribute to the projected shortage:

- There is a general decline in scientific literacy among the high school students of the last decade. Although many reports have called for improvement of school science curricula, it will be some time before much improvement can be expected.
- During the coming decade, the pool of high school graduates who are enrolling in college is expected to decline by about 25 percent nationally. Although the decline for the southern states and North Carolina is expected to be somewhat less, perhaps 15 percent, the same trend is evident. There are fewer students to go around.
- Fewer college students are enrolling in agriculture, biology and related sciences. During the 1960s and early 1970s, enrollment in agriculture and related sciences grew rapidly. Nationally, undergraduate enrollment in these sciences among colleges in the National Association of State Universities and Land Grant Colleges peaked at around 100,000 in 1975 and has since declined almost 20 percent to about 81,000. Enrollment in the School of Agriculture and Life Sciences at NCSU also peaked in 1975 at 2900, but has declined less, about 8 percent, to the current 2650.
- A high number of food and agricultural scientists in both industry and educational institutions began their careers shortly after World War II. These scientists and managers will retire in this decade, leaving a large number of potential vacancies. Some preliminary studies have indicated that up to 30 percent of these scientists in institutions of higher education will retire before 1990.

Unless patterns of enrollment change in rapid and unexpected ways, factors

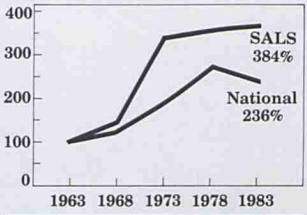
such as these will result in a shortage of human expertise estimated at 13 percent nationally. Although shortages will be at all degree levels, associate, baccalaureate and advanced, the situation will differ for various occupational clusters, but will be particularly acute in those occupations which require a high level of scientific and technological expertise. Research scientists who are essential for the continuation of progress based upon the discovery of new knowledge will be in short supply.



Recruiting the Best

The health of the agricultural establishment depends upon availability of future employees with appropriate skills, and the School of Agriculture has an active recruiting program to acquaint our high school graduates with the opportunities in agriculture. Guidance counselors and science teachers receive newsletters and take tours of agricultural research and employment sites. Career days bring prospective students to the campus for a first hand look at educational opportunities in agricultural sciences at NCSU. The SALS speakers bureau puts schools in touch with scientists in a variety of different areas.

Undergraduate Enrollment Index
1963 = Base Year



SALS enrollment doubled between 1962 and 1968. Then it doubled again between 1968 and 1973, reaching a peak in 1975.

In the 1983 entering freshman class in the School of Agriculture and Life Sciences, only 25 percent of the students came from farm backgrounds. With the decline of students coming from rural and farm families, efforts to recruit students from urban areas have been increased.

Business, education and government will all be competing with agriculture in recruiting quality graduates. The future strength of North Carolina's food and agricultural complex, however, depends upon the success of our efforts to convince young people that we can offer exciting opportunities to develop and apply science and technology for the solution of critical problems.

E. W. Glazener

Generating interest in farm animals is no problem for SALS students on field days, but recruiting students for future SALS classes will take increasing effort. Shortages of agricultural researchers are predicted by the end of the decade.

THE RURAL HOME AND COMMUNITY

An increasing population for the state and an increasing number of people wanting to live "in the country," will have an impact on rural communities and families in the 1990's.

North Carolina's population is expected to increase by 30 percent between 1980 and the year 2000, bringing the total number of people in the state to 7.7 million. Nearly three-fourths of that growth will be due to in-migration.

Increasing non-farm population in rural areas may trigger conflicts between farm and non-farm populations regarding pest control, water quality, waste disposal, property rights and taxation of farmland.

These conflicts, coupled with revenue sharing reductions by the federal government, could find local governments grappling with complicated problems, never before faced.

To assure wise decision-making, community leaders will look to educational agencies, such as the Agricultural Research Service and the Agricultural Extension Service, to provide technical information, help with surveys and studies, train leaders and help locate needed resources.

In the 1990's fewer rural families will depend solely upon farm income to meet their needs. Instead the trend will be towards more high-tech, cost intensive forms of employments. Since the main ingredient of these new industries will be information, it may be possible for some employees to remain at home, transmitting their work to a central location through computer technology.

Increasing demands for skilled labor will encourage people to retrain and change jobs in mid-life. This will reinforce the trend of more adult learners at all post-secondary institutions.

Age composition of the population will also be an important factor in community and home life in the 1990's. The number of children will remain relatively stable; the number of workers will increase, but at a reduced rate and the number of elderly will increase dramatically, reaching a level of nearly 13 per cent of the population by the end of the century.

What this graying of North Carolina means will become increasingly clear. There may be additional burdens on health delivery systems and greater demand for congregate feeding sites and day-care centers for senior citizens.

On the positive side, older citizens will bring experience and knowledge to problem solving, and may provide a cadre of volunteers that can help communities and extend their resources.

In the 1990's communities will become more inner-directed, as families work together to solve mutual problems, rather than looking to federal or state governments for solutions and funding. in fact, we will see many more public-private partnerships when it comes to providing services to a community.

A financial crunch at the local level may force major tax reforms that could make the tax burden more equitable than may be true under current policies.

Concerns of Families

Families in the 1990's will need to develop the management skills necessary for economic and social well-being.

They will be concerned with meeting daily expenses and providing for a financially secure future. How successful they are will depend on level of purchasing power, income stability and resource management skills.

Many rural families will try to stretch discretionary income through "cottage industries," or through truck

Increases in North Carolina population place new demands on community services.

gardening and marketing cooperatives. These small businessmen and women will look to the Agricultural Extension Service for help in developing management techniques and marketing skills.

Rural families will use computers in their farm and business operations and as a tool for family financial management. Research needs to be done on the role of the computer in expediting decisions and in fostering economic security.

Escalating health costs in the 1980's will make families more receptive to educational information that links foods and nutrition to health and well-being. Obesity is the number one health problem in North Carolina, affecting 30 percent of all middle-aged men and 40 per cent of the women. Cancer is the number two killer in the country. Over one-third of all cancers are believed to be related to excess calorie intake, high levels of fat, high levels of protein or deficiencies of vitamin A, vitamin C and fiber.

Nutrition education classes, conducted in communities, could help rural families understand the benefits of weight control and the importance of reducing the amount of sugar, salt and fat in the diet.

Additional research is needed; research that continues to explore the relationships between food choices and health. Also needed are studies that can correlate the adoption and use of dietary standards to household practices, resource limitations and age of family members.

Increased housing demands and increasing energy costs will also be of concern to rural families and communities. New housing will be downsized to conserve resources, to make housing more available to families and to accomodate changing lifestyle.

In a desire to improve home environment, families will look to Extension and other educational agencies for information on energy retrofits, energy efficient designs and energy management. Downsizing will place new emphasis on interior arrangements. Furnishings will not only be functional; they'll be aesthetically pleasing to help meet the physiological and psychological needs of families.

The technology revolution of computer, cable television and video-cassettes will change the home. Technology will make it possible for people not only to learn, play and sleep at home, but to work there. This will change space use and type of furnishings used. More research needs to be done in this area.

In many communities there will be more housing units per acre. Communities will get into some areas of service delivery they may not have considered to date. Leading the list will be the pressure to provide clean, safe water to a much higher proportion of residents than is now the practice.

Further development of solid waste collection and disposal systems that have a potential for resource recovery will also be given more attention by local units as a result of public and fiscal pressures. Again leaders will turn to community and rural development specialists for guidance.

To cope with the changing world around them, rural families and community leaders will ask educational agencies for assistance in communications, interpersonal relationships, adult growth and development, local government and citizen organization and economic and manpower development.

By using an interdisciplinary approach, research and extension can help North Carolina residents develop the techniques and management tools needed for social and economic well-being in the 1990's.

Contributors to this section include Martha Johnson, Jacqueline Voss, Maurice Voland, W. C. Clifford, R. C. Wimberley, M. C. Shulman, R. L. Moxley, A. C. Davis, and J. Christensen.

NORTH CAROLINA'S EXTENSION DELIVERY SYSTEM

Since 1914, The Extension Service has used a variety of teaching methods and delivery systems to disseminate information to the people. Although person-to-person instruction remains important, television and computers will be among the common teaching tools of the next decades.

Scientific and technical information now increases fifteen percent per year, which means it doubles every 5.5 years.

Employees of the North Carolina Agricultural Extension Service form an important link between the researcher in the laboratory and the non-scientist at home or in the workplace.

Not only do Extension staffers have more information to disseminate; they face expanded competition for the attention of clients. The computerization of agribusiness and consumer information makes it possible for other agencies and services to access, collect and disseminate information that used to be mostly in the domain of Extension.

By employing the latest technology, Extension is speeding up the turnaround time from researcher to client.

Changing Technology

Extension is no stranger to media technology. Since the early 1920's, agents and specialists have used radio to disseminate many kinds of information; television has been used since the 1950's.

In more recent years, videotape; dial access systems, such as "Extension Teletip"; satellite-transmitted messages; closed-circuit television, and multi-image presentations have been added to the more traditional tools of publications, audio-tape, news articles, movies and slides.

Other opportunities have been virtually untapped. In addition to television programming on public and commercial stations, Extension will further explore cable television as a way to reach clientele.

Two-way interactive cable is on the way. Several states have already tested the system. In the future, Extension staff at the county and state levels could be top candidates for two-way television dialogue.

Tele-text is moving past the infant stage. Soon, the contents of Extension publications or research journals may reach clients via their television screens.

Teleconferencing with video tapes is an effective and economical tool. A tape of the subject to be discussed by teleconference is mailed to all sites to review just before a telephone conference call. While not the same as a live video conference, the cost is only a fraction of the former and the effect can be quite satisfactory.

Computer-based Information System

Bob Kramer at the Kellogg Foundation predicts that by 1990, 75 percent of all commercial farmers will use computers as a management tool. Computers will be as common in the home as the microwave oven is today.

Computer owners want their terminals to: 1) bring in information from outside data banks; 2) feed information from their computers to off-farm and out-of-home entities, including marketing firms, input suppliers and government agencies; and 3) monitor on-farm or in-the-home systems.

Computer hardware is well in place, but there is need for additional software. Extension specialists at both the national and state levels were leaders in developing and making available computer software for farmers and some consumers.

Four systems were prototypes for land-grant information networks. Although AgNet started in Nebraska with talent from there and five other University staffs, farmers and ranchers are now accessing it as a commercial service. More than 300 programs are available through AgNet.

The Computerized Management Network (CMN), developed at Virginia Polytechnic Institute, was a pilot project of the Federal Extension Service. Its primary users were Extension personnel.

Michigan's COMNET and Indiana's FACTS, designed as instate networks, are prototypes for North Carolina's land-grant information system. As of April 1984, computers were in place in 64 North Carolina counties and 60 software packages were available. Additional counties will come on board as monies permit. Monies are also earmarked for upgrading of hardware, development of additional software and maintenance of units.

Extension is not the only developer of computer software for agriculture; several commercial companies are programming agribusiness information for farmers. At least one has approached the U.S. Department of Agriculture to act as a retailer of all USDA reports, outlook data and news for other commercial vendors of agricultural information.

If this materializes, commercial farmers in increasing numbers may subscribe to these large data bases, bypassing Extension.

User fees and other costs to participate in a computer network system vary. Generally, the user must pay any regular phone charges, a charge per-hour when on-line with the computer, and a charge for storage of the data base.

The North Carolina Agricultural Extension Service does not charge for information. It does, however, charge for retrieving and copying programs, and for the disk and postage. There is also a fee for listing a program.

Diverse Target Audiences

Going hand-in-hand with the proliferation of new media is an increasing demand from diverse audiences for Extension information. Traditional clientele remain, but many new and varied groups have entered the Extension educational mainstream. They include part-time farmers, small farmers, suburban gardeners, urban dwellers, and limited income families.

Extension still reaches out to many of these people through direct contact. In some cases, this means one-to-one interactions; in others it means contact between Extension personnel or volunteers and group audiences in such forums as organized meetings, workshops and field days.

As resources become more scarce, some groups and individuals may be efficiently reached through paraprofessionals or trained volunteers rather than by Extension professionals. In master volunteer programs, candidates are trained by Extension professionals. In return for training, volunteers donate a minimum of 20 hours service to Extension.

To meet the needs of large numbers of people and urban audiences, Extension will continue to use "teletip", mass media and electronic technology. Topics that lend themselves to "mass" dissemination are nutrition, safety, health, gardening, horticulture and energy conservation.

In addition, Extension will experiment with innovative delivery strategies that are responsive to clientele's time schedules: i.e., audio tapes for commuters; taped messages that can be dialed 24 hours a day; programs that can be stored on videotape or computer disks and called up when the client needs information; or self-study programs that can be used at a client's convenience.

Challenges

Knowing the needs of Extension clientele is imperative. The Extension Advisory Leadership System in each county and at the state level assures a dialogue between the users of Extension's services and the packagers and producers of that information. This important link will continue to be strengthened. Even so, Extension will continue to face challenges when it comes to choosing and using various delivery systems. Limitations to the use of certain media include the cost of software production and programming and the cost of hardware. Information must be kept updated and accurate.

Added use of new technology will demand personnel interested and skilled in development and application of that technology. Training and updating of communication skills will be a must.

The North Carolina Agricultural Extension Service, at all levels, is responding to the impact of the current information explosion, media expansion and diversity of audiences.

Contributors include D. G. Harwood, L. F. McCutcheon, and J. R. Christensen

SELECTED PROGRAMS FROM THE EXTENSION SERVICE

HOME ECONOMICS

HOUSEBUY—economics of home purchase
RECALL—food intake analysis

ECONOMICS DISK

FMCOST—farm machinery cost analysis
FINWHIZ—interest, payment and loan analysis
IRR—internal rate of return for cash flows
TVM—time value of money

FORESTRY DISK

NECORE—net cost of reforestation
DISCO—discounting investment cash flows
LOPLIN—loblolly plantation investment analysis
LOGGING—operating costs for logging systems

FIELD CROPS DISK

CROPBUD—NCSU enterprise budgets
CROPRENT—crop breakeven return
GRMOIS—wet to dry grain conversion
CBRCONT—CBR management -peanuts

HORTICULTURE DISK

FROSTPRO—sprinkling rates necessary to prevent frost damage

Agricultural Research Service Financial Report

STATE FISCAL YEAR
ENDING JUNE 30, 1983[1]

RECEIPTS FROM NON-FEDERAL FUNDS	
State Appropriations	$19,891,328
Miscellaneous Receipts, Overhead Receipts, Miscellaneous Perquisites, Sale of Equipment.	1,493,602
Foundations, Gifts, Grants and Contracts	3,487,569
Total Non-Federal Fund Receipts	$24,872,553
EXPENDITURES BY CLASSIFICATION	
Personal Services and Benefits	$19,581,368
Non-Salary Program Support	5,291,185
Total Non-Federal Fund Expenditures	$24,872,553

FEDERAL FISCAL YEAR
ENDING SEPTEMBER 30, 1983[2]

RECEIPTS FROM FEDERAL FUNDS	
Hatch	$ 4,323,972
Regional Research	1,005,047
Animal Health and Disease Research	92,560
McIntire-Stennis	385,120
Federal Grants and Contracts	5,312,649
Total Federal Fund Receipts	$11,119,348
EXPENDITURES BY CLASSIFICATION	
Personal Services and Benefits	$ 6,617,277
Non-Salary Program Support	4,502,071
Total Federal Fund Expenditures	$11,119,348

[1]The State Fiscal Year covers the period July 1, 1982 - June 30, 1983.
[2]The Federal Fiscal Year covers the period October 1, 1982 - September 30, 1983.

Agricultural Extension Service Financial Report

STATE FISCAL YEAR
ENDING JUNE 30, 1983[1]

RECEIPTS FROM NON-FEDERAL FUNDS	
State Appropriations	$15,712,652
Overhead Receipts	3,864
Foundations, Gifts, Grants and Contracts	849,585
Total Non-Federal Fund Receipts	$16,566,101
EXPENDITURES BY CLASSIFICATION	
Personal Services and Benefits	$14,394,286
Non-Salary Program Support	2,171,815
Total Non-Federal Fund Expenditures	$16,566,101

FEDERAL FISCAL YEAR
ENDING SEPTEMBER 30, 1983[2]

RECEIPTS FROM FEDERAL FUNDS	
Smith-Lever	$ 9,208,588
1890 College	112,885
Expanded Nutrition	2,385,626
Non-Point Source Pollution	15,183
Pest Management	231,903
1862 Part-Time Farmers	51,180
Pesticide Impact Assessment	94,605
Renewable Resource Extension Act	39,046
Tennessee Valley Authority	174,986
Indian Affairs	71,446
Federal Grants and Contracts	411,621
Total Federal Fund Receipts	$12,797,069
EXPENDITURES BY CLASSIFICATION	
Personal Services and Benefits	$10,493,147
Non-Salary Program Support	2,303,922
Total Federal Fund Expenditures	$12,797,069

North Carolina Agricultural Research Service Cooperators

Abbott and Cobb, Inc.
Agrifim, Inc.
Agway Seeds
Alfa-Laval
American Egg Board
American Soybean Association
AMFAC Nurseries, Inc.
Arbor Acres Farm
Asgrow Seed Company
George J. Ball, Inc.
Becton Dickinson and Company
Blackwell Nurseries
Blanchard Land Company
Brik Pak Inc.
W. Atlee Burpee Company
Burroughs Wellcome and Company
Carrolls Plant Center
Chemical Industry Institute of Toxicology
Cherry-Burrell
Clay's Hatchery
Corn Growers Association of N.C. Inc.
Coor Farm Supply Service, Inc.
Coulbourne Lumber Company
DeRuiter Seed Company
Dessert Seed Company, Inc.
Diamond Shamrock Company
Diversey Wyandotte Corp.
Paul Ecke Poinsettias
Elanco Products Company
Ferry-Morse Seed Company
Finch's Blueberry Nursery
Fred C. Gloeckner Company, Inc.
Goldsboro Milling Company
Goldsmith Seeds, Inc.
W.R. Grace, Company
Gulf and South Atlantic Fisheries Development Foundation, Inc.
Joseph Harris Company, Inc.
Hawes Farming Corporation
Hoffman-LaRoche, Inc.
House of Raeford
Hubbard Farms
Hydro-Gardens, Inc.
International Paper Company
International Potato Center
L.B. Izzi
J & L Greenhouses
Nash Johnson & Sons' Farms
The Johnson Wax Fund, Inc.
Kamlar Corporation
Laurel Lake Nursery, Inc.
Perry Lowe
Mallinckrodt, Inc.
McLambs Nursery
Merck and Company
Henry F. Michell Company, Inc.
Miles Laboratories
Monsanto
Moroni Feed Company
MSD/AgVet
National Association of Animal Breeders
National Pork Producers Council
Netherlands Flower-Bulb Institute
New England Fisheries Development Foundation
Nichibei Fisheries, Inc.
N.C. Ag Foundation
N.C. Apple Grower's Association
N.C. Christmas Tree Association, Inc.
N.C. Corn Growers Association
N.C. Crop Improvement Association
N.C. Dairy Foundation
N.C. Foundation Seed Producers, Inc.
N.C. Grape Growers Association
N.C. Peanut Growers
N.C. Pickle Producers Association
N.C. Soybean Producers Association, Inc.
N.C. Tobacco Foundation, Inc.
Northrup King Company
Otis Twilley Seed Company, Inc.
Peanut Growers
Pioneer Hi-Bred International Inc.
Plantco, Inc.
O.S. Plastics
R.J. Reynolds Tobacco Company
Rhom and Haas Company
Rhone-Poulenc Chemical Company
H. Smith Richardson Trust
The Rockefeller Foundation
P.O. Scherer Corporation
Sierra Chemical Company
Earl J. Small Greenhouses
Southern Region Pesticide Impact

Spayd Fruit Farm
Sta-Green Plant Food Company
A.E. Staley Company
Stauffer Chemical Company
Swift and Company
Tarheel Turkey Hatchery
Tennessee Valley Authority
Thomasson Nursery
3M Company
Union Carbide Corporation
Uniroyal
Vaughan-Jacklin Company, Inc.
Webb Foodlab, Inc.
The Weyerhaeuser Company
Wilders Nursery
Wise Foods Division, Borden's Inc.
Zapata-Haynie Corporation

COMMERCIAL AGREEMENTS

Abbott Laboratories
Ag-Research, Inc.
Carl S. Akey, Inc.
American Cyanamid Company
Applied Research Groups, Inc.
Armak Company
Allied Fibers and Plastics
American Minerals
BASF Wyandotte Corporation
Bershad Foundation, Inc.
BFC Chemicals, Inc.
Biocon (U.S.), Inc.
Blochj and Guggenheiner, Inc.
Bloch and Guggenheimer, Inc.
Bone Farms
Cambridge Products, Ltd.
Campbell Institute for Research and Technology
H.P. Cannon & Son, Inc.
Carolinas Golf Foundation
Center for Regulatory Services
Chore-Time Equipment, Inc.
CIBA-GEIGY Corporation
Chevron Chemical Company
Corn Growers Association of N.C., Inc.
Cotton, Inc.
Dalton's Best Maid Products,Inc.
Degesch America, Inc.
Diamond Shamrock Corporation
Dicky-John Corporation
Distributors Processing, Inc.
Dow Chemical Company
E.I. duPont de Nemours and Company
Eastern Artificial Insemination Cooperative, Inc.
Elanco Products/Eli Lilly Company
EM Industries, Inc.
Frit Industries
FMC Corporation
Fred C. Gloeckner Foundation, Inc.
Great Lakes Chemical Corporation
Helena Chemical Company
X.L. Herd, Inc.
Hill Top Farms
Hoffman-LaRoche, Inc.
Homes for Bluebirds, Inc.
ICI Americas, Inc.
International Minerals and Chemical Corporation
International Paper Company
International Wheat Gluten
Kemin Industries
Lilly Research Laboratories
Mallinckrodt, Inc.
Merck & Company, Inc.
Mobay Chemical Corporation
Monsanto Chemical Company
Philip Morris
Murphy Products Company, Inc.
National Kraut Packers Association, Inc.
National Mushroom Company
Netherlands Flower-Bulb Institute
NOR-AM Agricultural Products
North American Plant Breeders
N.C. Certified Sweet Potato Seed Growers
N.C. Commercial Flower Growers Association
N.C. Foundation Seed Producers, Inc.
N.C. Phosphate Corporation
N.C. Pickle Producers Association
N.C. Trellised Tomato Growers Association
Otsuka Chemical Company, Ltd.
Paramount Foods, Inc.
R.E. Parnell Farms
Pennwalt Corporation
Pickle Packers International, Inc.
Pilgrim Farms, Inc.
Pioneer Hi-Bred International
Potash-Phosphate Institute
PPG Industries
Phone-Poulenc, Inc.
R.J.R. Technical Company
H.Smith Richardson Charitable Trust
A.H. Robins Company
W.B. Roddenbery Company, Inc.
Rohm and Haas Company
Royster Agricultural Products Company
Sandoz Incorporated
The Schering Corporation
R. Sechler and Son, Inc.
Shaver Poultry Breeding Farms, Ltd.
Shell Chemical Company
Shell Development Company
Showa Denko K.K.
Sierra Chemical Company
A.O. Smith Harvestore Products, Inc.
Smith Kline
Southeastern Poultry & Egg Association
Southern Forest Research Center
Southern Soybean Disease Workers
Sta-Green Plant Food Company
Stauffer Chemical Company
Stroller Chemical Company
Swift and Company
Syntex Research
Texasgulf, Inc.
3M Company
Tobacco Foundation
Turfgrass Council of N.C.
Union Carbide Agricultural Products Company, Inc.
Uniroyal Chemical
The Upjohn Company
J.G. Van Holten and Son, Inc.
Velsicol Chemical Corporation
Virginia-North Carolina Select Sires, Inc.
Vlasic Foods, Inc.
Westvaco Corporation
Weyerhaeuser Company
Whitmire Research Laboratories
Zoecon Corporation

COOPERATORS-FOREST RESOURCES

Alabama River Pulp Company
American Can Company
Aracruz Florestal
Bansefor
Boise—Cascade
Brunswick Pulp and Paper Company
Buckeye Cellulose Corporation
Carton de Colombia
Carton de Venezuela
Champion International, Inc.
Chesapeake Corporation of Virginia
CONARE
Container Corporation of America
Continental Forest Industries, Inc.
COPINUS
Crown-Zellerbach Company
EMBRAPA/IDBF
ESNACIFOR
Federal Paper Board Company, Inc.
First Colony Farms
Georgia Kraft Company
Georgia Pacific Corporation
Gold Kist, Inc.
Great Southern Paper Company
Hammermill Paper Company
George H. Hepting Hardwood Management Research Fund
Hiwassee Land Company
INIF
International Forest Seed Company
International Paper Company
ITT Rayonier, Inc.
Jari Florestal
Kimberly Clark Corporation
MacMillan-Bloedel Products, Inc.
Masonite Corporation
Monterrey Florestal
National Institute of Forest Research of Mexico
Remington Arms Company
Republic of South Africa
St. Regis Paper Company
Scott Paper Company
Tennessee River Pulp and Paper Company
Tennessee Valley Authority
Union Camp Corporation
Westvaco Corporation
Weyerhaeuser Company

North Carolina Agricultural Extension Service Cooperators

A.B.C. Laboratories, Inc.
ADKAR
Ag-Mark, Inc.
Carl S. Akey, Inc.
A.L. Laboratories, Inc.
Albemarle Feeder Pig Cooperative
Aldrich Nursery
All American Selection
Allied Chemical Corporation
Allied Mills, Inc.
Alpha Gamma Rho, NCSU Chapter
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American Association of Retired Persons
American Breeders Service
American Cyanamid Company
American Dairy Association
American Hoechst Corporation
American Pelletizing Corporation
American Quarter Horse Association
American Simmental Association
American Tobacco Company
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Amoco Foundation, Inc.
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Ansul Company
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Applied Research Group
Argura Nursery
Asgrow Seed Company
Austinville Limestone Company
Avery Farms

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James Bardin
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Beatrice Foods Company
Belding Lily Corporation
Bell Seed Farm
Shelton Benson
Bigelow Carpets
Blue Channel Corporation
Boddie-Noell Enterprises, Inc.
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Boots Hercules, Inc.
Breeden Poultry and Egg Company
Charles Bruce
Buckeye Cellulose Corporation
Buckman Laboratories, Inc.
Bull City Sertoma Club
Buncombe County Rural Development Panel
Burley Tobacco Farmer
Burlington Industries
W. Atlee Burpee Company
Burrell Nursery
Business Men's Assurance Company of America
Byrd Tractor and Equipment Company

Canal Wood Corporation of Lumberton
H.P. Cannon & Sons
Capps Bookstore
Carbisco, Inc.
Cargill International
Cargill-Nutrena Feeds Division
Carlisle Poultry Company
Carnation Company
Carnation Genetics
Carolina Golf Association
Carolina Gypsum
Carolina Packing Company
Carolina Power and Light Company
Carolina Sertoma Club
Carolina-Virginia Section Institute of Food Technologists, Inc.
Carolina's Best
Carolinas Cotton Growers Association
C.B. Caroon Seafood
Carroll's Foods
Carroll's of Warsaw
Catawba County Chamber of Commerce
Celanese Research Company
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Ceva Laboratories, Inc.
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Chevron Chemical Company
Chicago Board of Trade
Chick Sales Agency
Chicopee Mills, Inc.
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Clinton Area Chamber of Commerce
Coats and Clark, Inc.
Coble Dairy Cooperative
Coca-Cola Company
Cody Farms
Coker's Pedigreed Seed Company
Columbia Nitrogen Corporation
Columbiana Seed Company
Concord Farms
Concrete Construction Company
Cooperative Council of North Carolina
Coor Farm Supply Service, Inc.
Cotton, Inc.
Crescent Electric Membership Corporation
Crop Protection
Cross' Poultry Company
Cryovac Corporation
Cuddy Company
Cutter

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Danforth Foundation
Davidson Electric Membership Corporation
John Deere Company
DeKalb, Inc.
DeKalb AgResearch, Inc.
Denholm Seed Company
Joe Denning
Diamond Shamrock Company
Diamond Shamrock Chemical Company
Dinner Bell Foods, Inc.
Dixie Chemical Corporation
Dixie Furniture Company, Inc.
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Downtown Sertoma Club
Drexel Chemical Company
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Duke Power Company
E.I. duPont de Nemours and Company
Durham Life Broadcasting, Inc.

East Tennessee Select Sires
Eastman Kodak Company
Frankey Susanne Ebert Memorial Endowment
Eden Chamber of Commerce
R.A. Edwards
Elanco Products Company
Eli Lilly Company
Engineered Farm Systems, Inc.
Excel Hybrid Seed, Inc.
Export Leaf Tobacco Company
E-Z Mix Animal Nutrition, Inc.

Fairmount Chemical Company
Farm Bureau Federation of N.C.
Farm Credit Service
Farm Management Services
Farmers Cooperative Council of N.C.
Farmers Forage Research Cooperative
Fayetteville Fire Department
Fayetteville Publishing Company
FCX, Inc.
Federal Cartridge Corporation
Federal Land Bank and Production Credit Associations in North Carolina
Federal Land Bank—Clinton
Federal Land Bank—Smithfield
Federal Land Bank—Statesville
Federal Paper Board Company, Inc.
Federation of Garden Clubs
Ferguson Manufacturing Company
Ferry-Morse Seed Company
Fieldcrest Mills, Inc.
Firestone Tire and Rubber Company
First Union National Bank
Fitzgerald Nursery
Flavorite Lab
Lynn Floyd
The Flue-Cured Tobacco Farmer
FMC Corporation
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Formax Feeds
Forsyth County 4-H Horse Clubs
4-H Horse Council of Mecklenburg County

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Greene Milling
Greenwood Seed Company
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Gregson Furniture Industries
Guilford County 4-H Horse Club
Gurley's Inc.

Hancock Poultry
Hardin's Nursery
Harper-Crawford Bag Company
Mrs. L.R. Harrill
Joseph Harris Seed Company, Inc.
Haver-Lockhart
High Point Chamber of Commerce
High Point Sertoma Club
Hillcrest Farms
Hillsborough Graded Feeder Pig Sale
Foy T. Hinson
Hobb's Seed Farm
Hoffmann-La Roche, Inc.
Hog Slat, Inc.
Holbrook Farms
Holly Farms Inc.
Francis Holt
Homesworth Corporation
Hoopers Transplants
House of Raeford Turkey Farm
Humac Corporation
Hyde Mountain Horse Farm

ICI Americas, Inc.
Ideal Production Credit Association
IEM Plastics
Insurance Company of North America
Integrated Pest Management Project
International Harvester Company
International Minerals Corporation
International Minerals and Chemical Corporation
International Paper Company
Iredell Livestock Company

Joan of Arc
Johnson Manufacturing Company
Nash Johnson & Sons, Inc.
Tom Jordan

Kaizer Agricultural Chemicals
Kalo Laboratories, Inc.
Kannapolis Chamber of Commerce
Keel Peanut Company
Kennum, Inc.
Kelly Manufacturing Company
Kemin Industries, Inc.
Kerr Glass Manufacturing Corporation
Kieffer Paper Mills
King Photo Supply
Knob Creek
Kraft, Inc.

The Lane Company, Inc.
Lane Poultry
Land of Sky Regional Council of Governments
Lenoir County Livestock Association
Lexington Swine Breeders
Lochaby Nursery
Long Manufacturing Company
Lumbee Farms
Lundy Packing Company

Madison-Mayodan Chamber of Commerce
Mallinckrodt
Malter Int. Corporation
Manco Genetics, Inc.
McCurdy Seed Company, Inc.
McDonald Corporation
McLaughlin Gormley King
McNair Seed Company
C.E. McSwain & Sons
Merck and Company, Inc.
Henry F. Michell Company
Microlife Technics
Micron Corporation
Milliken & Company
Milwaukee Seasoning Lab
Mitsubishi International
Mobay Chemical Corporation
Monsanto Chemical Company
Montedison, Inc.
Montgomery Ward & Company
Moore's Dairy Equipment Company
Moorman Manufacturing Company
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Morton Salt
Moser Growers
Mt. Airy Chamber of Commerce
Murphy Products Company
Myatt-Lutz Cattle Sales

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National 4-H Council
National Marine Fisheries Service
National Pork Producers Association
National Soybean Producers Association
Nationwide Insurance Company
Netherlands Flower-Bulb Institute
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Nitragin Company, Inc.
NOBA, Inc.
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North American Plant Breeders
N.C. Alternative Energy Corporation
N.C. Appaloosa Horse Association
N.C. Association of Broadcasters Foundation
N.C. Association of Electric Membership Cooperatives
N.C. Association of Insurance Agents, Inc.
N.C. Association of Nurserymen
N.C. Association of Soil and Water Conservation Districts
N.C. Auction Markets Association
N.C. Brown Swiss Breeders Association
N.C. Cattlemen's Association
N.C. Chapter of American Society for Landscape Architects
N.C. Commercial Flower Grower's Association
N.C. Commissioner of Agriculture
N.C. Corn Growers Association
N.C. Cotton Growers Wives Association
N.C. Cotton Promotion Association, Inc.
N.C. Council on Economic Education
N.C. Cowbelles Association
N.C. Crop Improvement Association
N.C. Dairy Foundation
N.C. Dairy Products Association
N.C. Dairy Goat Herd Improvement Association, Inc.
N.C. Dairy Promotion Committee
N.C. Department of Agriculture
N.C. Department of Natural and Economic Resources
N.C. Dressage & Combined Training Association
N.C. Egg Marketing Association, Inc.
N.C. Egg Packers Association
N.C. Egg Producers Association
N.C. Egg Processors and Packers Association
N.C. Energy Division
N.C. Extension Homemakers Association
N.C. Farm Bureau Federation
N.C. Fisheries Association
N.C. Foundation Seed Producers, Inc.
N.C. 4-H Development Fund
N.C. 4-H Honor Club
N.C. Granite Corporation
N.C. Grape Growers Association
N.C. Guernsey Breeders Association
N.C. Hatchery Association
N.C. Holstein Friesian Association
N.C. Home Builders Association
N.C. Horse Council
N.C. Horticultural Council, Inc.
N.C. Jersey Breeders Association
N.C. Landscape Contractors Association
N.C. Livestock Auction Markets Association
N.C. Meat Packers Association
N.C. Meat Processors & Country Ham Curers Association
N.C. Milk Commission
N.C. Motor Carriers Association
N.C. Mutual Hatchery Association
N.C. Peanut Growers Association
N.C. Pest Control Association
N.C. Pork Producers Association, Inc.
N.C. Poultry Federation, Inc.
N.C. Poultry Processors Association
N.C. Press Association
N.C. Purebred Dairy Cattle Association
N.C. Quarter Horse Association
N.C. Safety Council, Inc.
N.C. Seedsmens Association
N.C. Society of Farm Managers and Rural Appraisers
N.C. Soybean Producers Association
N.C. State Beekeepers Association
N.C. State Fair Association
N.C. Yam Commission, Inc.
N.C.S.U. 4-H Collegiate Club
N.C. Tobacco Foundation, Inc.
N.C. Turkey Federation
N.C. Veterinary Medical Association
N.C. Wildlife Resources Commission
N.C. Yam Commission
Northrup King Seed Company
North State Sertoma Club
North Wake Animal Hospital
Northwest District 4-H Advisory Board
Northwest District 4-H Horse Show
Northwest District 4-H Leaders Association
Nutra-Tech

Olin
Onslow County 4-H Horse Program
Optimist Club of Raleigh
Otsuka Chemical Company

Pamlico Chemical Company
Pan-American Seed Company
George J. Park Seed Company
Parkdale Mills
Peanut Coalition Cooperative Association
Frank Penn
J.C. Penney Company

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Plant Food Association of N.C.
Plymouth Fertilizer Company
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PPGy Industries, Inc.
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Rhodia Inc.-Chipman Division
Rhone-Poulenc, Inc.
Ring-Around Products, Inc.
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Rohm and Haas Company
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Select Sires, Inc.
Sellers Chemical Corporation
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Sheepman Supply Company
Shell Chemical Company
Sierra Chemical Company
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Smith Douglas Fertilizer Company
C.W. Smith
Smithfield Packing Company
Smith-Kline
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Star Milling
Statesville Feeds Division of Bartlett Milling Company
Stauffer Chemical Company
Gary Stott Memorial Fund
Stratford Sertoma Club
Sunbeam Farms
Sun Shelter
Sunnyside Eggs
Sunnyview Nursery
Swift and Company
Syntex

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Tar Heel Veterinarian Supply Company
Tarboro Area Chamber of Commerce
Teepak, Inc.
Tennessee Valley Authority
Texasgulf, Inc.
Thomasville Furniture Company
Thompson-Hayward Chemical Company
3-M Company
Tipper Tie, Inc.
Tobacco Associates, Inc.
Transcontinental Gas Pipe Line Company
Triangle J Council of Governments
Triangle Sertoma Club
Tri-State Distributors
Tuco
Turfgrass Council of N.C.
TVA

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The Upjohn Company
Union Oil Company of California
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Unique Furniture Makers, Inc.
U.S. Borax Company
U.S. Gypsum Corporation
USS Agrichemicals
USS Chemicals
Urbana Laboratories
Vaughan-Jacklin Corporation
Velsicol Chemical Corporation
Vigortone
Art Viles, Flying V Farm
Virginia Electric and Power Company
Virginia-North Carolina Select Sires
Vulcan Materials, Inc.

Wacker Chemie
Wachovia Bank and Trust Company
Schley Waddell
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Wake County 4-H Horse Program
Wallace-Chadburn Feeder Pig Sale
Watson Seed Company
Wayne Feeds, Inc.
Wayne County Livestock Association
Webster's Nursery
Wells Nursery
Western Carolina Livestock Market
West Winston Sertoma Club
Westinghouse Electric Corporation
Weyerhaeuser Company Foundation
Whirlpool
Martha White Foods
White Poultry
Whitmire Research Labs, Inc.
Wildwood Lamps
Wilkinson's Interiors
In Memory of Thomas E. Wilson and Friends of Kenneth H. Anderson
Wilson Livestock Supply
Woodson-Tenent Labs
Woolfolk Chemical Works
WRAL-TV and Tobacco Radio Network
Job P. Wyatt & Sons Company
Wyatt-Quarles Seed Company

XL Herd
Yadkinville Sertoma Club
Yoder Brothers, Inc.
J.W. York, Whisperwind Farm
Zema Corporation

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Kellenberger Foundation
Monsanto
Moses Cone Hospital, Greensboro
Natick Labs
The Near East Foundation
Proctor and Gamble
The Research Triangle Institute
Soap and Detergent Association
Southern Bell of North Carolina

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Credits

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Contributing Editors: *Tom Byrd and W.L. Carpenter.*

DR LAWRENCE M CLARK
ASST PROVOST
BOX 7101
NCSU CAMPUS

NORTH CAROLINA STATE UNIVERSITY
Raleigh, N. C. 27650

ADULT AND COMMUNITY COLLEGE EDUCATION
Office of R. David Mustian
120 Ricks Hall
Telephone: 737-2819

M E M O R A N D U M

TO Dr. Larry Clark

ACTION REQUESTED

__ Please note and return
__ Please handle
__ For your information
X Review and pass on
__ Let's discuss

Re: Associate Dean Research Position

Signed David Mustian

Date 11-10-83

North Carolina State University

School of Agriculture and Life Sciences
Academic Affairs, Extension & Research

Office of the Dean
Box 5847, Raleigh 27650
Tel: 919-737-2668

June 11, 1984

Provost Nash N. Winstead
109 Holladay Hall
NCSU Campus

Dear Nash:

I am pleased to enclose a copy of the 1983 Annual Report for the School of Agriculture and Life Sciences, "LOOKING AHEAD, The Future of North Carolina Agriculture". In this report we have addressed some of the issues that undoubtedly will be a part of our future agricultural agenda.

Sincerely,

J. E. Legates, Dean

JEL: pb

Enclosure

North Carolina State University
School of Agriculture and Life Sciences
School of Physical and Mathematical Sciences

Department of Biochemistry
Box 7650, Raleigh, N. C. 27650
Telephone: (919) 737-2581

May 18, 1984

Dr. Charles C. Sweeley
Professor and Chairperson
Department of Biochemistry
Biochemistry Building
Michigan State University
East Lansing, MI 48824

Dear Dr. Sweeley:

I have contacted several of my colleagues who are willing to support the fine booklet you are producing, "Science Career Magazine." Please send an invoice to each of them for the amount indicated; I am returning the invoice you misdirected to me. I shall distribute the booklets you have already sent to me. Please note that in the case of Dr. Clark, the funds will not be available until after July 1, 1984, whereas in the other two cases, the funds must be committed before June 30, 1984.

Dr. Lawrence Clark — $500.00
Assoc. Provost and Affirmative Action Officer
Box 7101
North Carolina State University
Raleigh, NC 27695-7101

Dean George F. Bland — $200.00
Assistant Dean, School of Engineering
Box 7901
North Carolina State University
Raleigh, NC 27695-7901

Dr. Robert D. Bereman, Associate Dean — $200.00
School of Physical and Mathematical Sciences
Box 8201
North Carolina State University
Raleigh, NC 27695-8201

We are interested in learning about any subsequent copies of the magazine to be produced, and about the responses you receive to the current effort.

Sincerely,

Elizabeth C. Theil

Elizabeth C. Theil, Ph.D.
Professor of Biochemistry

jhf
Enclosure
cc: L. Clark
G. Bland
R. Bereman

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF BIOCHEMISTRY · BIOCHEMISTRY BUILDING EAST LANSING · MICHIGAN · 48824 · USA

May 4, 1984

Dr. Elizabeth Thiel
Department of Biochemistry
North Carolina State University
P.O. Box 5050
Raleigh, NC 27650

Dear Dr. Thiel:

I have enclosed 2 copies of "Science Career Magazine" for your use. The total printing was 10,000 copies; we are distributing about 8,000 of them to high schools throughout the country, chosen on the basis of requests from contributors and minority enrollment. The remaining copies promised to you are being sent separately and will arrive in about a week; if you want to have them sent to another address, please let me know immediately (517-353-3257).

I am grateful for your contribution and direct you to look at the credits on the inside back cover where that contribution is acknowledged. I know you will be as proud as I am about the excellence of this brochure. I am confident that it will have a positive impact in the long run.

I shall send a copy of Science Career Magazine to each of the state Departments of Education in the hope that funds can be generated for a second printing later this year. Single copies can be purchased at that time for about $2.50 (assuming a printing of at least 5,000 copies).

Sincerely yours,

C. C. Sweeley

Charles C. Sweeley
Professor and Chairperson

CCS/tf
Enclosure(s)

N O R T H C A R O L I N A S T A T E U N I V E R S I T Y at R A L E I G H

School of Agriculture and Life Sciences
Academic Affairs, Extension and Research

Office of the Dean
112 Patterson Hall

Date April 4, 1984

MEMORANDUM TO: Dr. J. L. Apple
Dr. D. F. Bateman
Dr. C. D. Black
Dr. L. M. Clark
Dr. E. W. Glazener
Dr. N. N. Winstead

SUBJECT: Confirmation of Scheduled Meeting

This is to confirm the meeting recently scheduled as follows:

Date Tuesday, May 1, 1984

Time 8:30 a.m. - 3:00 p.m.

Place Room 2, Patterson Hall

Purpose: Annual Meeting with N. C. A&T to Discuss Agriculture Programs.

J. E. Legates, Dean

Cc: Dean Burleigh C. Webb

North Carolina State University

School of Agriculture and Life Science
Academic Affairs, Extension & Research

Office of the Dean
Box 7601, Zip 27695-7601
919-737-2668

April 18, 1984

MEMORANDUM TO: Dr. J. L. Apple
Dr. D. F. Bateman
Dr. C. D. Black
Dr. L. M. Clark
Dr. E. W. Glazener
Dr. N. N. Winstead

SUBJECT: Proposed Meeting on May 1, 1984 with North Carolina A&T Administrators

I received a call yesterday from Dean Webb that he will have to be in the hospital for an extended stay, including the date of May 1 when we were to meet in Raleigh. A scheduling difficulty would have prevented their Academic Vice Chancellor from participating.

As a consequence the May 1, 1984 meeting is cancelled. Dean Webb will be in touch with me after he returns from the hospital about alternate dates. In all likelihood we will have to wait until early June to reschedule our meeting.

J. E. Legates, Dean

JEL: pb

NORTH CAROLINA STATE UNIVERSITY at RALEIGH

School of Agriculture and Life Sciences
Academic Affairs, Extension and Research

Office of the Dean
112 Patterson Hall

Date April 4, 1984

MEMORANDUM TO: Dr. J. L. Apple
Dr. D. F. Bateman
Dr. C. D. Black
Dr. L. M. Clark
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J. E. Legates, Dean

Cc: Dean Burleigh C. Webb

North Carolina State University
School of Agriculture and Life Sciences

Department of Zoology
P. O. Box 5577
Raleigh, N. C. 27650

March 14, 1984

MEMORANDUM

TO: Dr. Lawrence M. Clark

FROM: W.C. Grant

SUBJECT: Enloe Math and Science Symposium

Slides needed for the Symposium are indicated below:

1. Black History Month. Black people and Muntu. Explain significance of Muntu.
2. Slide of globe showing African continent
3. Historians (Woodson. Franklin)
4. Immotep (drawing)
5. Slide with writing about Immotep
6. Iron smelting furnace
7. Sirius B
8. "
9. "
10. Cover of Van Sertima's They Came Before Columbus
11. Olmec heartland
12. Three slides of stone heads
13. Thor Heyerdahl's "Ra I" (Papyrus boat)
14. Columbus' statement about people of Espanola trading with Blacks
15. Benjamin Bannaker
16. Norbert Rillieux
17. Lewis Latimer
18. Elijah McCoy

19. Granville T. Woods

20. Garrett Morgan

21. Jan Matzeliger

22. Dr. Daniel Hale Williams

23. Heart (and inset showing Dr. Daniel Hale Williams)

24. Valve in heart

25. Pacemaker

26. Pacemaker in place (diagram)

27. Artificial heart

28. Dr. Charles Drew

29. Dr. Drew and others with patient

30. Dr. George Washington Carver (later years). (Not the slide with the potatoes)

31. Ernest Just (3 slides.

    Dr. Just at microscope.
    Slide showing cell division.
    Dr. Just, Vice Pres., Amer. Soc. Zoologists

32. Dr. Mary McCleod Bethune

33. Frederick McKinley Jones

34. Brian Jackson at x-ray lithographic printer

35. Katherine Johnson

36. James E. West at electron microscope

37. Christine Darden

38. Annie Easley

39. Robert E. Shurney
    Moon buggy ("Falcon")

40. George Carruthers with lunar surface U.V. camera/spectrograph

41. Slide listing courses (science, English, math, etc.)

ENLOE MATH AND SCIENCE SYMPOSIUM

Name: Dr. William C. Grant (substituting for Dr. Lawrence Clark) Phone No. 737-2402

Presentation Title: Afro-Americans in Science

Please list any equipment that you will need such as an overhead projector, screen, slide projector, etc.

2 x 2 Carousel Projector and a screen

Please describe any other needed arrangements such as gas, running water, tables, etc.

What time do you plan to arrive at Enloe: 9:50 a.m.

Do you need a map/directions? No

Would you like to eat lunch with us? Unable to do so

During which session(s) would you like to present? Please check those which are convenient for you. We have already marked (x) those which we indicated in our conversation. Please note any changes.

Session #1 10:00 - 11:15 X Session #1

Session #2 12:10 - 1:25 X No

Session #3 1:30 - 2:45 X Session #3

As many as you can, please.

Thank you for your help! See you at Enloe on March 30!

North Carolina State University
School of Agriculture and Life Sciences
School of Humanities and Social Sciences
Department of Economics and Business

P. O. Box 5368
Raleigh, N.C. 27650

(919) 737-3273

DATE: Monday, February 20, 1984

TO: NCSU Black Faculty and Staff

FROM: Endia Hall
Bill Grant

RE: Monthly meeting

Our next meeting is scheduled for Friday, February 24 at 11:30 a.m. in the Walnut Room, 4th floor, University Student Center.

Dr. Cecil Fitz-George Brownie, Assistant Professor of Pharmacology/Toxicology at the School of Veterinary Medicine will be our guest speaker and will present an up-to-date report on "The Status of Blacks in the Veterinary Profession." Please plan to attend!

A very important business meeting will precede Dr. Brownie's presentation; therefore, we would like to ask that you try to arrive no later than 11:30 a.m.

For your information--

A new study of black health professions in America reports:

--Tuskegee Institute as the only school of veterinary medicine out of 27 located on a predominantly black college campus. Since 1945 Tuskegee has educated 85% of the nation's black veterinarians.

--Although blacks accounted for 11.7% of the U.S. population in 1980, blacks comprised 1.6% of veterinarians.

--In order to achieve a ratio of black veterinarians to black population equal to the ratio of white veterinarians to white population, U.S. schools must train 3,589 additional black veterinarians.

Lawrence Clark
201 Holladay Hall

CAMPUS MAIL

North Carolina State University
School of Agriculture and Life Sciences

Department of Zoology
P. O. Box 5577
Raleigh, N. C. 27650

February 9, 1984

MEMORANDUM

TO: Students and Advisors

FROM: W. C. Grant W. C. Grant

SUBJECT: Visit by Dr. George Hill, Meharry Medical College

Please help publicize the following announcement:

On February 16, Dr. George Hill will be on campus to present a seminar and to confer with persons interested in the life sciences. We urge you to come and take advantage of this opportunity to interact with this internationally-renowned biologist.

Speaker:	Dr. George Hill Director and Professor Division of Biomedical Sciences Meharry Medical College Nashville, TN
Date and Time:	Thursday, February 16 at 4:00 p.m. (Refreshments at 3:45 p.m.)
Place:	3712 Bostian Hall
Topic:	"Identification of the function of maxicircle DNA in trypanosomes, using recombinant DNA techniques"

On Friday, February 17, at 1:00 p.m., Dr. Hill will discuss recombinant DNA techniques. This meeting will be held at 3533 Gardner Hall.

Additional Biographical Information

Dr. George Hill

Education

B.A. (Biology)	Rutgers University, Camden, NJ
M.S. (Parasitology/Biochemistry)	Howard University, Washington, DC
Ph.D. (Biochemistry)	New York University, New York City
Postdoctoral Study	University of Kentucky, Lexington
	University of Cambridge, Cambridge, England

Numerous Honors, Including:

NIH Research Career Development Award
Recipient--Seymour H. Hutner Prize, awarded by the Society of Protozoologists for outstanding research

Major Research Interest

Biochemical basis of differentiation in trypanosomes

North Carolina State University
School of Agriculture and Life Sciences

Department of Zoology
P. O. Box 5577
Raleigh, N. C. 27650

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Biochemical basis of differentiation in trypanosomes

NORTH CAROLINA STATE UNIVERSITY
Office of Provost and Vice-Chancellor
Holladay Hall

Raleigh, N. C.

Agriculture & Life Sci.

TO: Dr. Phyllis Faulkner

2/9/84
Date

ACTION REQUESTED ON ATTACHED:

_____Note and Return
_____For your information (need not return)
_____Please handle
_____Please answer; furnish me copy
_____Please circulate
_____Please draft reply for my signature
_____Please give me your comments
_____Requires your approval
_____Please return attachments

Attached is the list of Black graduate students. I hope this will be helpful.

Dr. Grant will give you a list of the Preprofessional Club members also.

FROM: Carolyn Ingram
Secretary to Dr. Clark

1/31/84

MEMORANDUM

To Larry Clark **Re** George Hill's seminar

I imagine Dr. Hill wants to recruit for his school, but I'd like to recruit a full house for his talk. I think hearing and seeing an internationally known black scientist would be good for the morale of our black students (and an eye-opener for some of our white ones). Can you drum up some interest in this speaker in the black student groups you are in contact with? We could arrange meetings with students who might be interested in Mahanry or who would just like to meet Dr. Hill. We plan to take Dr. Hill out to dinner after the seminar. Would you like to join us? We try to pick a restaurant that is priced so that students can join us. If you can think of any students who would like to come, bring them along!

If you have any ideas about how to swell the audience, let me know.

Bill Grant
Pre professional Club

Couple 2873
Roster of Black Students

Signed: Phyllis Bradburn

Date _____

ZOOLOGY DEPARTMENT
NORTH CAROLINA STATE UNIVERSITY

ZOOLOGY SEMINARS
Spring 1984

January 19. DR. ROBERT GROSSFELD. Department of Zoology, North Carolina State University. "Long-term survival of injured crayfish nerve fibers." Room 2722 Bostian Hall. 4:00 p.m.

January 26. DR. BARBARA GRIMES. Department of Biology, North Carolina Central University. "What is catastrophe for the copepod is opportunity for Vampyrophyra; adaptations in the life cycle of a histophagous ciliate." Room 2722 Bostian Hall. 4:00 p.m.

February 2. DR. RICHARD D. ALEXANDER. Museum of Zoology, University of Michigan. "Naked mole rats and the evolution of eusociality." BRANDT LECTURE. Room 2722 Bostian Hall. 4:00 p.m.

February 9. DR. PETER MARLER. Field Research Center, Rockefeller University. "Song learning in birds, a neuroselectional view." Room 2722 Bostian Hall. 4:00 p.m.

February 16. DR. GEORGE HILL. Medical School, Meharry University. "Identification of the function of maxicircle DNA in trypanosomes, using recombinant DNA techniques." Room 2722 Bostian Hall. 4:00 p.m.

February 23. DR. LISA LEVIN. Department of Marine, Earth, and Atmospheric Sciences, North Carolina State University. Title to be announced.

March 1. DR. JERRY OXFORD. Medical School, UNC-Chapel Hill. Title to be announced, topic patch-clamp analysis of ion transport across membranes. Room 2722 Bostian Hall. 4:00 p.m.

March 15. DR. BESSIE HUANG. Baylor University. "Genetic dissection of eukaryotic flagella." Room 2722 Bostian Hall. 4:00 p.m.

March 22. DR. FRED LANNI. Department of Biology and Center for Flourescent Research, Carnegie-Mellon University. Title to be announced, topic flourescent techniques in cell biology. Room 2722 Bostian Hall. 4:00 p.m.

March 29 DR. DAVID DEMONT. Department of Zoology, North Carolina State University. "Dermocystidium - a genus in limbo." Room 2722 Bostian Hall. 4:00 p.m.

April 5. DR. GAIL BURD. Rockefeller University. Title to be announced, topic immunocytochemical localization of peptides in canary brain. Room 2722 Bostian Hall. 4:00 p.m.

April 12. DR. JOSEPH TAKAHASHI. Northwestern University. Title to be announced, topic flow-through organ culture techniques in the study of circadian rhythms in pineal glands. Room 2722 Bostian Hall. 4:00 p.m.

April 19. DR. ANDRE BORLE. Medical School, University of Pittsburgh. Title to be announced, topic regulation of cellular calcium levels. Room 2722 Bostian Hall. 4:00 p.m.

April 26. DR. KEN McKAYE. Duke Marine Laboratory. Title to be announced. Room 2722 Bostian Hall. 4:00 p.m.

DEPARTMENT OF ZOOLOGY
NORTH CAROLINA STATE UNIVERSITY
Raleigh, N. C.
27650

PHONE 737-2741

2/13/84
Date

TO: Dr. Lawrence Clark

FROM: Bill Grant

Larry,

Dr. George Hall of Meharry Medical College will present a seminar in Zoology on Thurs., Feb. 16 at 4 p.m. and conduct a session on Friday (1-3 p.m.). His résumé is attached.

A group of us will take him to dinner Thursday evening. I've sent notices to Tommy and Floyd. Others may wish to attend various sessions or the dinner. Please help with publicity (as you talk with people). Thanks, Bill

CURRICULUM VITAE

NAME: George C. Hill, Ph.D.

TITLE: Director and Professor

BIRTH DATE: February 19, 1939

PLACE OF BIRTH: Morrestown, New Jersey

NATIONALITY: U. S. Citizen

SEX: Male

EDUCATION:

B.A.	1961	Biology	Rutgers University Camden, New Jersey
M.S.	1963	Parasitology/Biochemistry	Howard University Washington, D.C.
Ph.D.	1967	Biochemistry	New York University New York City, NY
1967 - 1969		Biochemistry	University of Kentucky Lexington, KY
1971 - 1972		Biochemistry	Molteno Institute University of Cambridge Cambridge, England

HONORS:

Rutgers University Scholarship - September 1957 - June 1961
Howard University Assistantship - September 1961 - June 1963
NIH Post-Doctoral Fellowship - October 1967 - October 1969
NIH Special Research Fellowship - June 1971 - June 1972
NIH Research Career Development Award - June 1974 - June 1979
Recipient - Seymour H. Hutner Prize - 1979 - which is awarded by the Society of Protozoologists for outstanding research in the field of Protozoology.

MAJOR RESEARCH INTEREST:

Biochemical basis of differentiation in trypanosomes.

RESEARCH SUPPORT:

1. NIH Research Career Development Award entitled DNA and Cytochromes in Kinetoplastida. (June 1, 1974 - May 31, 1979) - $150,000.

2. NIH Research Grant entitled the Function of Mitochondria in Trypanosomes. (June 1, 1974 - May 31, 1981) - $191,112.

3. United States Army Medical Research and Development Command Contract entitled Effects of Trypanocidal Drugs on the Function of Trypanosomes. (December 1, 1973 - July 1, 1983) - $445,381.

4. NIH Research Grant entitled Biochemistry of Cultured Infective Trypanosomes. (September 1, 1979 - August 31, 1983) - $226,300.

5. World Health Organization entitled Biochemistry of Cultured Infective Forms of Trypanosoma rhodesiense. (July 1, 1980 - October 31, 1982) - $110,000.

6. NSF Grant entitled Research Apprenticeships for Minority High School Students. (April 20, 1981 - August 31, 1982) - $15,000.

7. NIH Research Grant entitled Electron Transport Systems in Trypanosomes. (October 1, 1981 - September 30, 1985) - $422,394.

8. Fulbright Research Grant Award to perform research on African sleeping sickness at the University of Nairobi, Department of Biochemistry, Nairobi, Kenya (May, 1982 - September, 1982).

RESEARCH AND/OR PROFESSIONAL EXPERIENCE:

Aug 1983 - Present — Director and Professor, Division of Biomedical Sciences, Meharry Medical College, Nashville, Tennessee 37208.

May 1982 - Aug 1982 — Visiting Lecturer in the Department of Biochemistry at the University of Nairobi, Nairobi, Kenya. Visiting Scientist at the International Laboratory for Research on Animal Diseases (ILRAD), Nairobi, Kenya.

July 1979 - Associate Professor in the Department of Pathology, Colorado State University, Fort Collins, CO 80523.

July 1976 - July 1979 — Associate Professor in the Department of Pathology and the Department of Physiology and Biophysics, Colorado State University, Fort Collins, CO 80523.

Sept. 1975 - Aug. 1976 Lecturer at the Biochemistry Institute, Odense University, Odense, Denmark. During this period, we studied the affinity for oxygen of the various terminal oxidases in trypanosomes.

July 1972 - June 1976 Assistant Professor in the Department of Pathology and the Department of Physiology and Biophysics, Colorado State University.

June 1971 - June 1972 NIH Special Research Fellow at the Molteno Institute, University of Cambridge, Cambridge, England. I was involved in research characterizing nuclear and kinetoplast DNA in African trypanosomes. In addition, we studied the branched electron transport system that is present in cyanide-sensitive trypanosomes.

Oct. 1969 - June 1971 Research investigator in the Department of Microbiology, Squibb Institute for Medical Research, New Brunswick, N.J. I was the head of a research group with the primary responsibility of studying the biochemistry of parasites, particularly helminths and trypanosomes.

Oct. 1967 - Oct. 1969 NIH post-doctoral Fellow in the Department of Biochemistry, University of Kentucky Medical Center, Lexington, Kentucky. Fellowship grant was to study the effects of trypanocides on the formation and function of the electron transport system in Crithidia fasciculata, an insect trypanosomatid. Sponsor: Dr. David White (1967-68); Dr. S. K. Chan (1968-69).

July 1963 - Jan. 1966 Assistant Research Scientist at New York University for Dr. Helene N. Guttman. Primary responsibilities were to design and perform biochemical and nutritional experiments with protozoa.

PROFESSIONAL SOCIETIES:

American Society of Biological Chemists
American Association for the Advancement of Science
Society of Protozoologists
Sigma Xi

ORIGINAL INVESTIGATIONS AND THEORETICAL TREATISES:

Lincicome, D.R. and Hill, G.C. 1965. Oxygen uptake by Trypanosoma lewisi complex cells - I.L. isolate. Comparative Biochemistry and Physiology 14:425-435.

Hill, G.C. and Hutner, S.H. 1968. Effects of trypanocidal drugs of terminal respiration on Crithidia fasciculata. Experimental Parasitology 22:207-212.

Hill, G.C., Brown, C.A. and Clark, M.V. 1968. Structure and function of mitochondria in Crithidia fasciculata. The Journal of Protozoology 15:102-109.

Hill, G.C. and White, D.C. 1968. Respiratory pigments of Crithidia fasciculata. Journal of Bacteriology. 95:2151-2157.

Anderson, W. and Hill, G.C. 1969. Division of DNA synthesis in the kinetoplast of Crithidia fasciculata. Journal of Cell Science 4:611-620.

Hill, G.C. and Anderson, W.A. 1969. Effects of acriflavine on the mitochondria and kinetoplast of Crithidia fasciculata. Correlation of fine structure changes with decreased mitochondrial enzyme activity. The Journal of Cell Biology 41:547-561.

Hill, G.C., Perkowski, C.A. and Mathewson, N.W. 1971. Purification and properties of cytochrome c550 from Ascaris lumbriocoides var. suum. Biochimica et Biophysica Acta 236:242-245.

Hill, G.C., Gutteridge, W.E. and Mathewson, N.W. 1971. Purification and properties of cytochromes c from trypanosomatids. Biochimica et Biophysica Acta 242:225-229.

Hill, G.C., Chan, S.K. and Smith, L. 1971. Purification and properties of cytochrome c555 from a protozoan, Crithidia fasciculata. Biochimica et Biophysica Acta 243:78-87.

Bacchi, C.J. and Hill, G.C. 1972. Crithidia fasciculata: Acriflavine-induced changes in soluble enzyme levels. Experimental Parasitology 31:290-298.

Hill, G.C. and Cross, G.A.M. 1973. Cyanide-resistant respiration and a branched electron transport system in Kinetoplastida. Biochimica et Biophysica Acta 305:590-596.

Hill, G.C. and Bonilla, C.A. 1974. In vitro transcription of kinetoplast and nuclear DNA in Kinetoplastida. The Journal of Protozoology 21:632-638.

Kronick, P. and Hill, G.C. 1974. Evidence for the functioning of cytochrome o in Kinetoplastida. Biochimica et Biophysica Acta 368:172-180.

Hill, G.C. and Pettigrew, G.W. 1975. Evidence for the amino acid sequence of Crithidia fasciculata cytochrome c555. European Journal of Biochemistry 57:265-271.

Hill, G.C. and Degn, H. 1977. Steady-state oxygen kinetics of terminal oxidases in Trypanosoma mega. The Journal of Protozoology 24:563-565.

Hill, G.C., Shimer, S., Caughey, B. and Sauer, S. 1978. Growth of infective forms of Trypanosoma (T.) brucei on buffalo lung and Chinese hamster tissue culture cells. Acta Tropica 35:201-207.

Hill, G.C., Shimer, S., Caughey, B. and Sauer, L.S. 1978. Growth of infective forms of Trypanosoma rhodesiense in vitro, the causative agent of African trypanosomiasis. Science 202:763-765.

Njogu, R.M., Whittaker, C. and Hill, G.C. 1980. Evidence for a branched electron transport chain in Trypanosoma brucei. Molecular and Biochemical Parasitology 1:13-29.

Bienen, E.J., Hammadi, E. and Hill, G.C. 1980. Initiation of trypanosome transformation from bloodstream trypomastigotes to procyclic trypomastigotes. Journal of Parasitology 66:680-682.

Bienen, E.J., Hammadi, E. and Hill, G.C. 1981. Trypanosoma brucei: Biochemical and morphological changes accompanying in vitro transformation of bloodstream trypomastigotes to procyclic trypomastigotes. Experimental Parasitology 51:408-417.

Spithill, T.W., Shimer, S.P. and Hill, G.C. 1981. Inhibitory effects of chloramphenicol isomers and other antibiotics on protein synthesis and respiration in procyclic Trypanosoma brucei. Molecular and Biochemical Parasitology 2:235-255.

Johnson, B.J.B., Hill, G.C., Fox, T.D. and Stuart, K. 1982. The maxicircle of Trypanosoma brucei kinetoplast DNA hybridizes with a mitochondrial gene encoding cytochrome oxidase subunit II. Molecular and Biochemical Parasitology 5:381-390.

Bienen, E.J., Hill, G.C. and Shin, K. 1983. Elaboration of mitochondrial function during Trypanosoma brucei differentiation. Molecular and Biochemical Parasitology 7:75-86.

NON-EXPERIMENTAL ARTICLES AND REVIEWS:

Hill, G.C. and Anderson, W. 1970. Electron transport systems and mitochondrial DNA in Trypanosomatidae: A review. Experimental Parasitology 28:356-380.

Hill, G.C. 1976. Electron transport systems in Kinetoplastida. A Review. Biochimica et Biophysica Acta 456:149-193.

Hirumi, H., and Hill, G.C. 1983. African Trypanosomes in: CRC Press Review In Vitro Cultivation of Protozoan Parasites of Man and Domestic Animals, Jensen, James, Ed., CRC Press, West Palm Beach, Florida. In press.

Hill, G.C. 1983. Effects of trypanocides on respiration and energy production in target organism. The International Encyclopedia of Pharmacology and Therapeutics. Pergamon Press. In press.

ARTICLES IN BOOKS (EXPERIMENTAL PAPERS):

Hill, G.C. 1972. Recent studies on the characterization of cytochrome system in Kinetoplastida. In: Comparative Biochemistry of Parasites (ed. Van den Bossche, H.) pp. 395-415. Academic Press, New York.

Hill, G.C. 1976. Characterization of electron transport systems present during the life cycle of African trypanosomes. In: Biochemistry of Parasites and Host-Parasite Relationships (ed. Van den Bossche, H.) pp. 31-50. North Holland, Amsterdam.

Dalbow, D.G. and Hill, G.C. 1976. RNA synthesis and the effect of berenil in Leptomonas sp. and Trypanosoma brucei. In: Biochemistry of Parasites and Host-Parasite Relationships (ed. Van den Bossche, H.) pp. 493-499. North Holland, Amsterdam.

Hill, G.C. 1977. Characterization of electron transport systems present during differentiation of African trypanosomes. In: Functions of Alternative Oxidases (ed. Degn, H., Lloyd, D. and Hill, G.C.) pp. 67-77, Pergamon Press, Oxford.

Hill, G.C. and Degn, H. 1979. Characterization of the steady state oxygen kinetics of terminal oxidases in Trypanosoma rhodesiense. In: Biochemical and Clinical Aspects of Oxygen (ed. Caughey, W.) pp. 405-420. Academic Press, New York.

Hill, G.C. 1980. Biochemical studies using Trypanosoma rhodesiense cultured infective trypomastigotes. In: The Host-Invader Interplay (ed. Van den Bossche, H.) Elsevier/North Holland, Amsterdam pp. 555-566.

TEACHING:

I have taught Medical Parasitology, Cell and Molecular Biology, Structure and Function of Mitochondria, Biochemistry of Protozoa and General Biochemistry.

OTHER PROFESSIONAL ACTIVITIES:

Organized and directed the Colorado State University Science Motivation Program (January, 1974 - August, 1983). The goal of this program is to attract more minority high school students to the science professions.

Nominated to serve on the NIH Tropical Medicine and Parasitology Study Section from June, 1978 - June, 1982. In this capacity, I review research proposals submitted to NIH and help to set national policy for scientific research and education in the area of tropical medicine and parasitology.

Review grants on regulatory biology for the National Science Foundation, January, 1974 - Present.

Reviewed submitted articles for Journal of Protozoology, Journal of Parasitology, American Journal of Tropical Medicine and Hygiene, Molecular and Biochemical Parasitology Science, National Academy of Sciences, Proceedings, and Molecular and Cellular Biology.

Editorial Board

Molecular and Biochemical Parasitology
Les Annales de Parasitologie Humaine et Compares

University Committees

University Biohazard Committee (1978 - 1983)
College of Veterinary Medicine and Biomedical Sciences Biomedical Curriculum Committee (1978 - 1981)
Faculty Council Student Life Committee (1973 - 1975) - Chairman, 1975
Council of Deans Special Committee on Minority Recruitment (1972-1974).

POST DOCTORAL FELLOWS IN PROGRAM

Dr. Lodewijk Tielens (October, 1982 - August, 1983)
Dr. Tamal Roy (April, 1982 - July, 1983)
Dr. Barbara Johnson (July, 1979 - September, 1983)
Dr. Terry Spithill (November, 1978 - November, 1979) - currently Research Associate at Laboratory of Immunoparasitology, The Walter and Eliza Hall Institute of Medical Research, P. O. Royal Melbourne Hospital, Victoria 3050, Australia.
Dr. Muturi Njogu (1979) - currently Senior Lecturer in Department of Biochemistry, University of Nairobi, Nairobi, Kenya
Dr. Gerald Keilman (1976-79)

Dr. David Dalbow (1974-76)

GRADUATE STUDENTS IN PROGRAM

Miss Gina Benavides (September, 1982 - Present)

Students Completing Degree in Program

Jose Remiao (M.S.) - 1976
E. Jay Bienen (Ph.D.) - 1981
Ettimad Hammadi (M.S.) - 1981
Rance Lefebvre (Ph.D.) - 1982
Carla Whittaker (Ph.D.) - 1982

ADVISOR TO OTHER GRADUATE STUDENTS

Ida Lloyd - Microbiology - M.S. Student
Terry Timme - Microbiology - Ph.D. Student
Lisa Staudinger - M.S. Student

All are currently working on their Ph.D. at Colorado State University

North Carolina State University
School of Agriculture and Life Sciences
School of Humanities and Social Sciences
Department of Sociology and Anthropology

P.O. Box 5428
P.O. Box 5535
Raleigh, N.C. 27650

(919) 737-3180

January 20, 1984

MEMORANDUM

TO: Associate Provost Lawrence M. Clark

FROM: Ronald C. Wimberley, Head

RE: Recruitment of Temporary SALS Faculty for 1983-84

With the recent hiring of a part-time faculty member for the spring semester, our temporary recruitment efforts in SALS Sociology have been completed for the academic year.

The following persons have been hired:

Ms. Minnie M. Brown. Professor Emeritus, NCSU. Black female. Part-time teaching in Agricultural Institute, Spring 1984.

Ms. Kitty B. Herrin. ABD in Sociology, NCSU. White female. Visiting Part-time Instructor, Spring 1984.

Dr. Selz C. Mayo. Professor Emeritus, NCSU. White male. Part-time teaching in Agricultural Institute. Deceased, November 1983.

Mr. Thomas C. Shepherd. ABD in Sociology, NCSU. Black male. Part-time Visiting Instructor for 1983-84 academic year.

Please contact me if further affirmative action information is needed on temporary appointments.

RCW:fme

CC: Dean J. E. Legates

North Carolina State University
School of Agriculture and Life Sciences

Department of Zoology
P. O. Box 5577
Raleigh, N. C. 27650

January 11, 1984

Ms. Margaret R. Hunt
D.H. Hill Library
Box 5007
North Carolina State University
Raleigh, NC 27650

Dear Margaret:

On behalf of the Black Faculty and Staff, it is with regret that I accept your resignation as Secretary of the organization. You indicated that your appointment to the Library's Long Range Planning Committee will be very time-demanding. I can certainly appreciate the problem of the limitation of time.

We look forward to your continued participation in activities of the Black Faculty and Staff, and we deeply appreciate your assistance in the past.

Best wishes.

Sincerely,

Bill

William C. Grant
Associate Professor and
Chairman, Black Faculty and Staff

cc: BFS Executive Committee