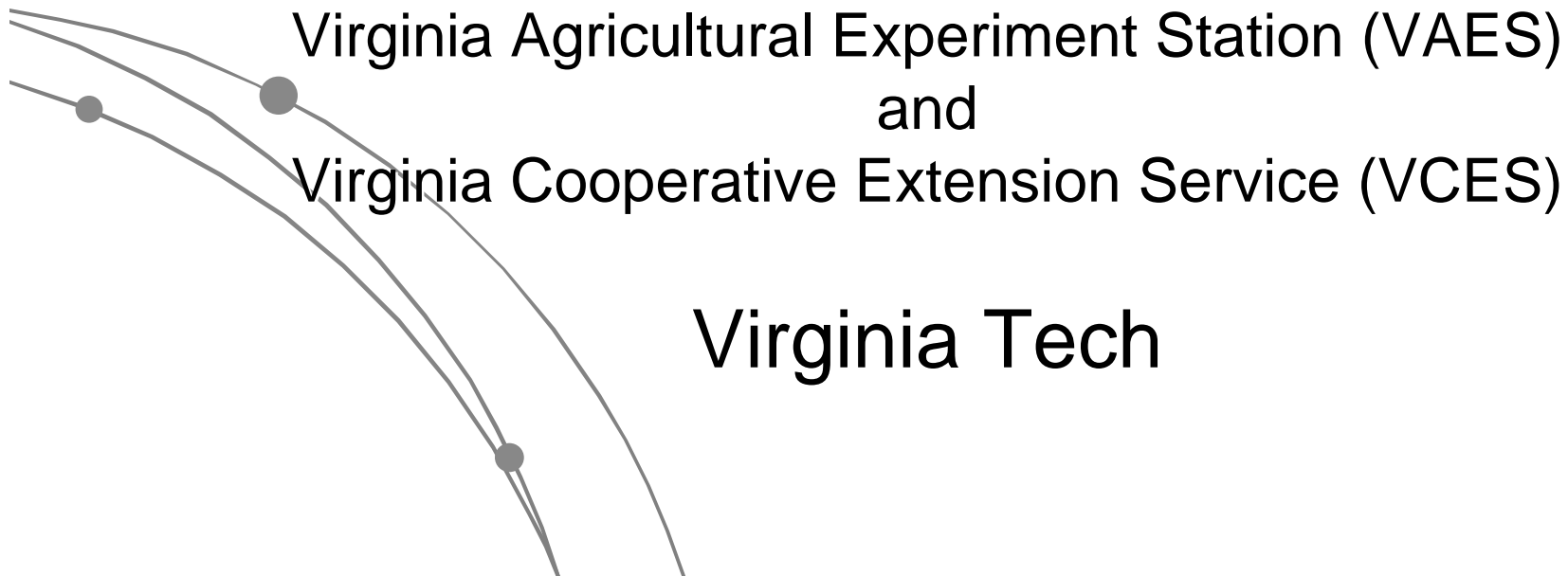


Food, Fuel, Fiber, and Health Initiative

The Role of the 229 Agency



229 AGENCY

Virginia Agricultural Experiment Station (VAES)

Virginia Cooperative Extension Service (VCES)

An agency of the land-grant university system that **develops and delivers** research-based technology, educational programs, and services not provided by any other state agencies.



This agency and its programs helps Virginia to create high quality jobs and economic vitality, while enhancing environmental quality and animal and human health.

Extension

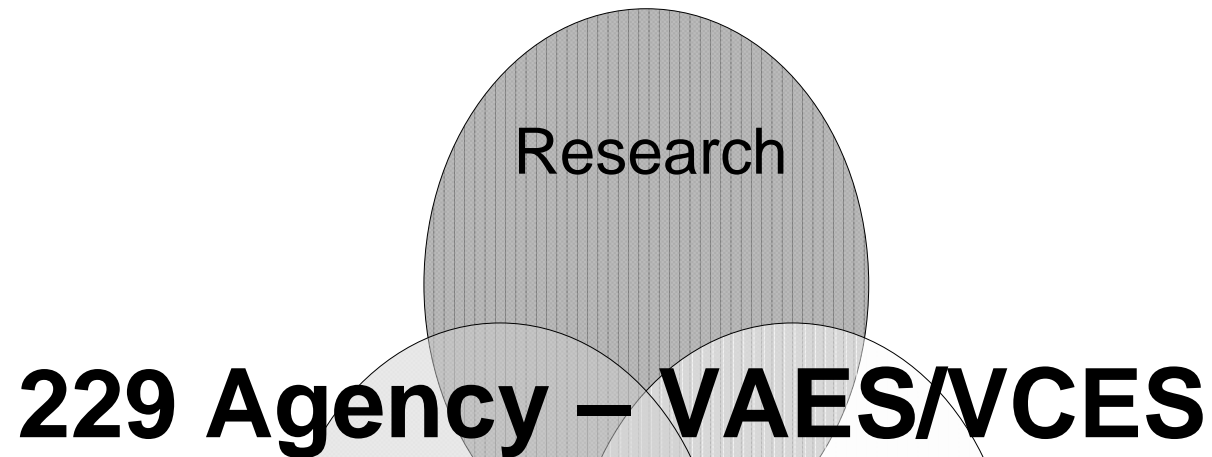
Teaching

"Invent the Future"

Research

*A Vision Building On Our Roots with
Innovation, Quality, and Results*

Agriculture and Life Sciences



229 Agency – VAES/VCES

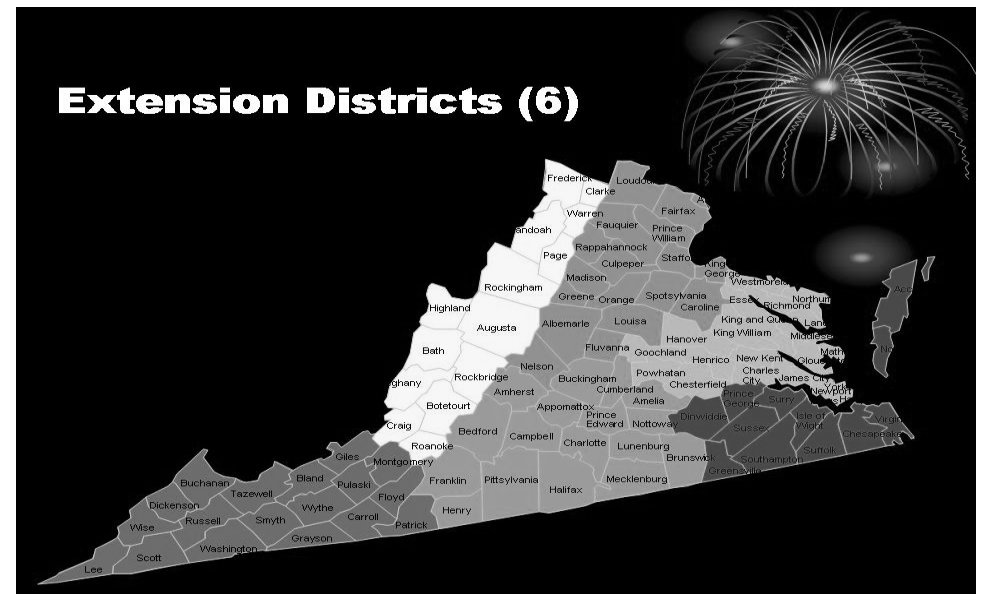
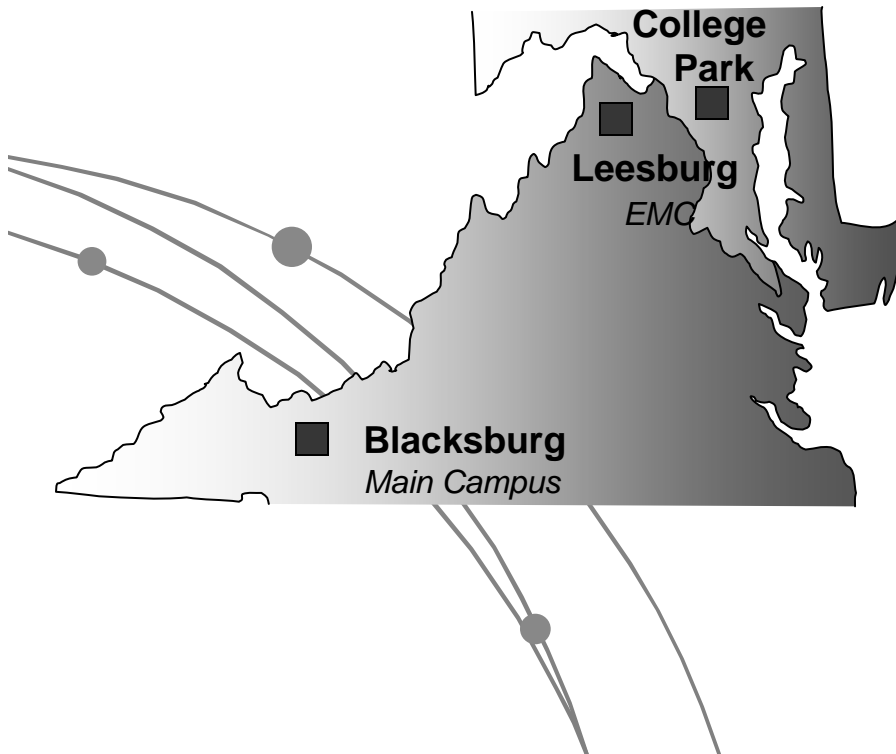
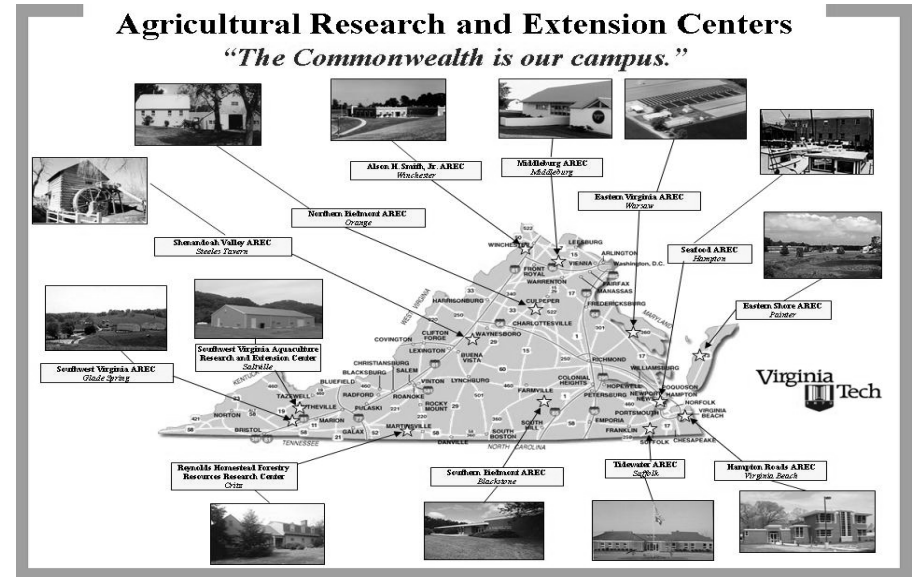


**Veterinary
Medicine**

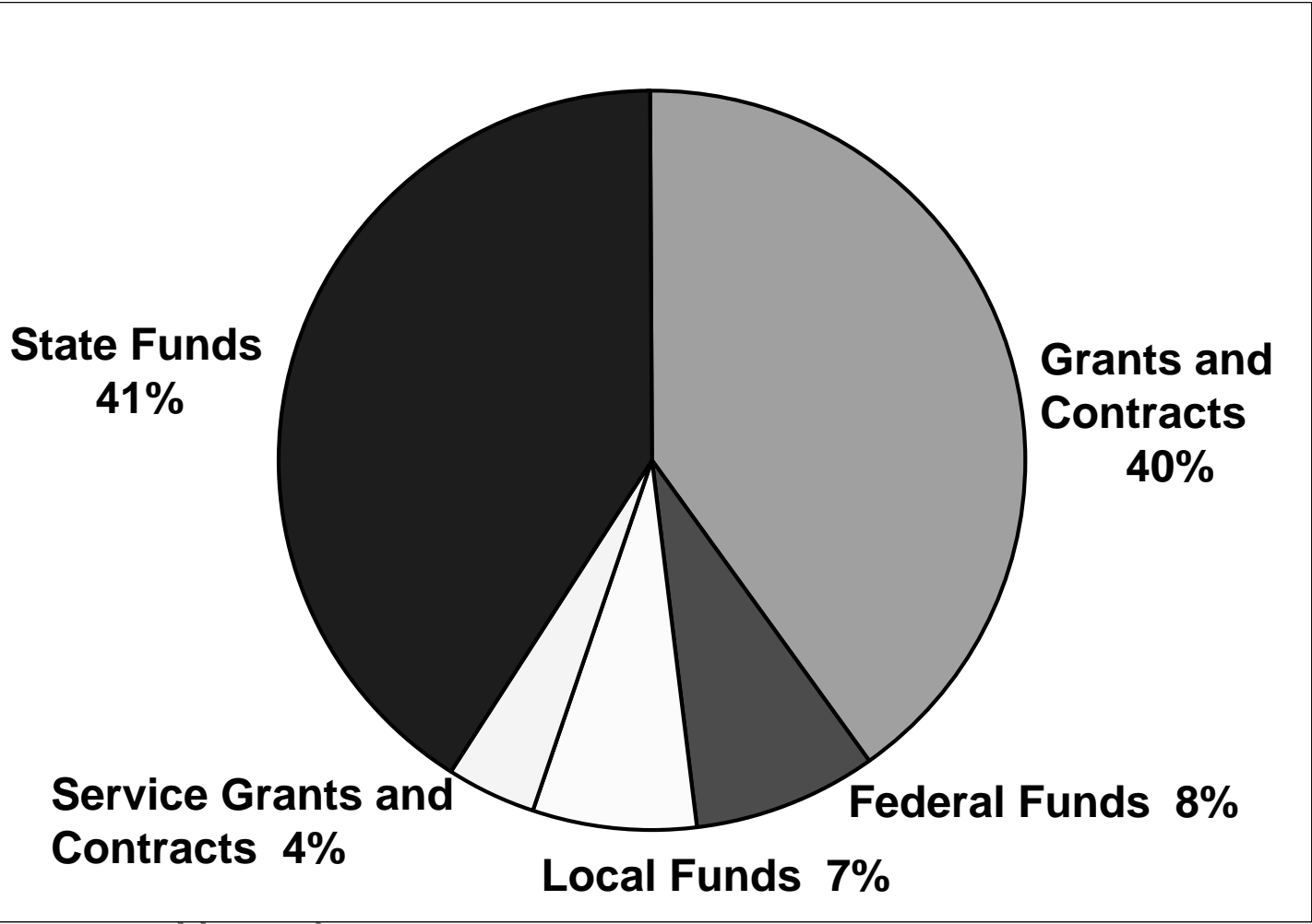
**Natural
Resources**

229 AGENCY COLLEGE NETWORK

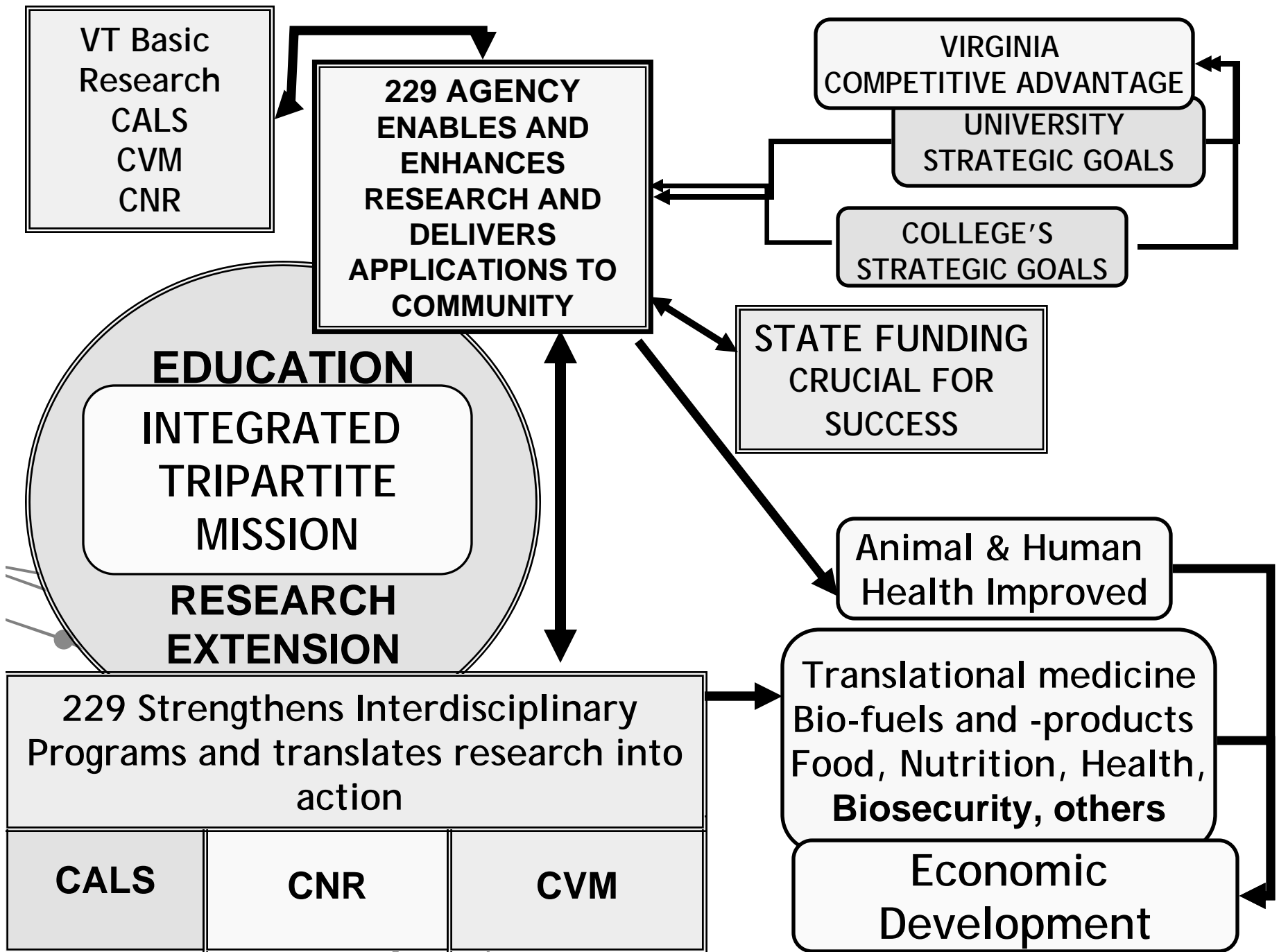
- VT Campus (3 colleges)
- AREC's (13)
- Vet Medicine (3 Facilities)
- Instruction/ Hospitals/ Research
- Extension



229 Agency Funding Sources



The 229 Agency generated \$99.6 million for the \$69 million invested by the Commonwealth. \$1 to \$1.45 return.



VT Basic
Research
CALs
CVM
CNR

**229 AGENCY
ENABLES AND
ENHANCES
RESEARCH AND
DELIVERS
APPLICATIONS TO
COMMUNITY**

VIRGINIA
COMPETITIVE ADVANTAGE

UNIVERSITY
STRATEGIC GOALS

COLLEGE'S
STRATEGIC GOALS

STATE FUNDING
CRUCIAL FOR
SUCCESS

EDUCATION

INTEGRATED
TRIPARTITE
MISSION

**RESEARCH
EXTENSION**

Animal & Human
Health Improved

229 Strengthens Interdisciplinary
Programs and translates research into
action

Translational medicine
Bio-fuels and -products
Food, Nutrition, Health,
Biosecurity, others

CALS

CNR

CVM

**Economic
Development**

Virginia Tech
Institutes (IBPHS)
and Colleges

Communities, business
and consumers

Producers and
producer organizations

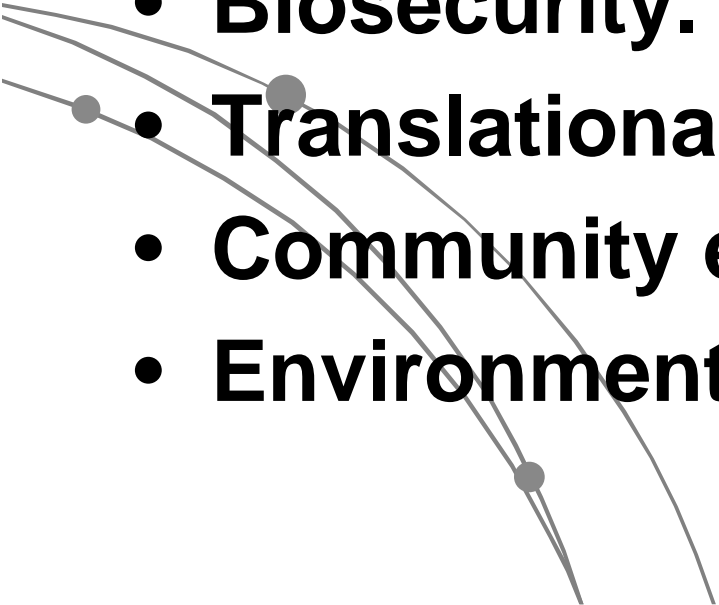
"CLUSTER HIRES"
*Leveraging Resources
through Partnerships*

Public and
private sector
organizations

Community Colleges
Virginia Universities
Carilion Medical System
Novozymes

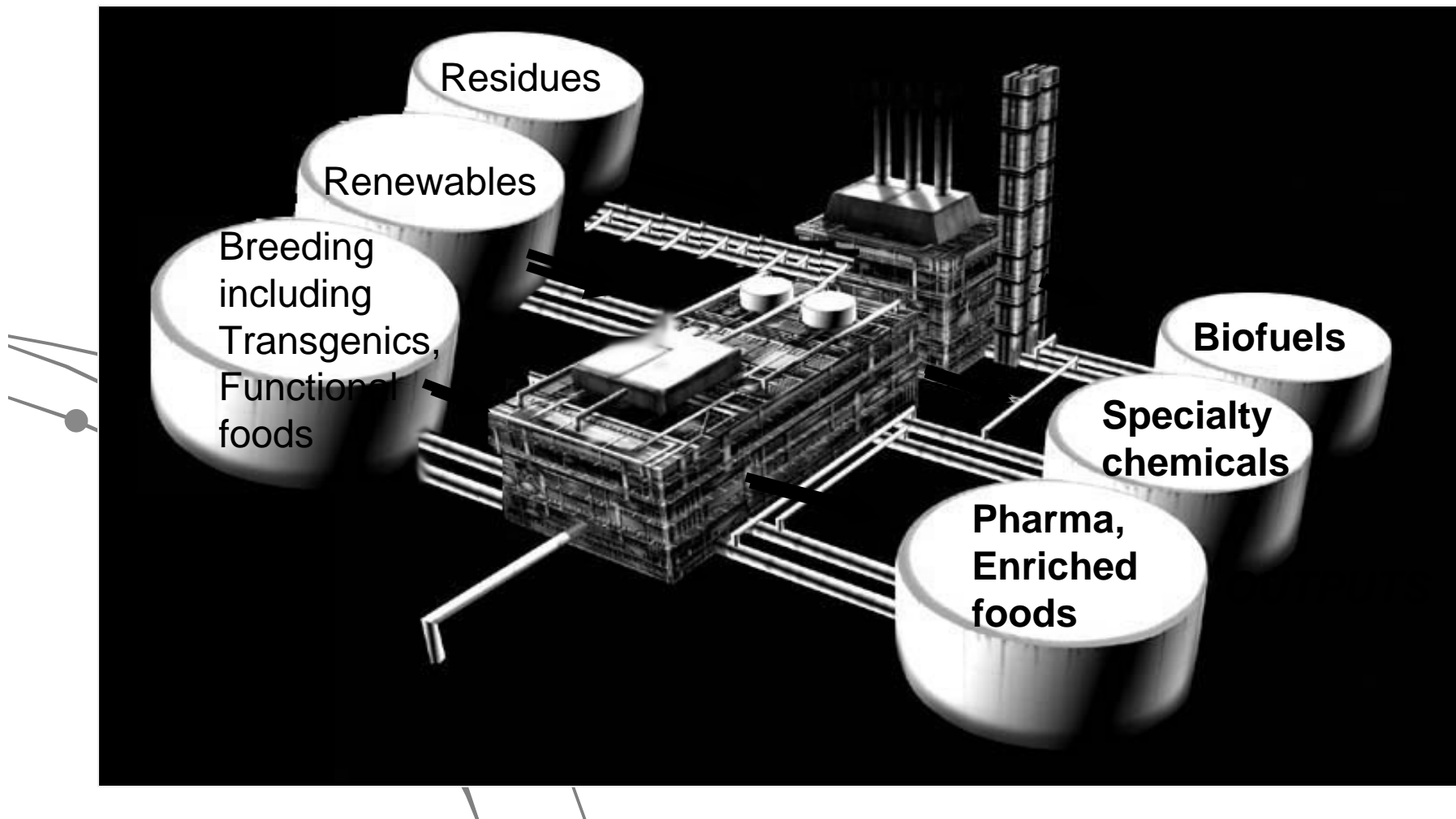
Federal and state
governments
and agencies

“The New Frontiers”

- **Biobased products.**
 - **Health and nutrition.**
 - **Biosecurity.**
 - **Translational medicine and research.**
 - **Community economic viability.**
 - **Environmental stewardship.**
- 
- A decorative graphic consisting of three curved lines that sweep from the left side of the slide towards the bottom right. Each line has a small grey circular dot placed on it. The lines are thin and grey, and the dots are also grey.

BIOPROSSESSING (Product Development) and BIODESIGN (Breeding)

“Biobased Products”





Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE
AND STATE UNIVERSITY

Engineering soybeans for improved nutrient management

Goal: to alter P storage in seeds to improve nutrient availability and reduce environmental impact



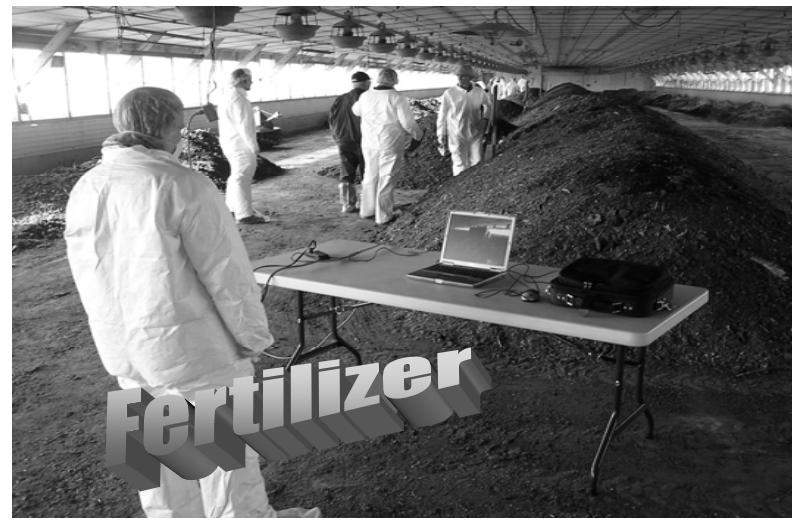
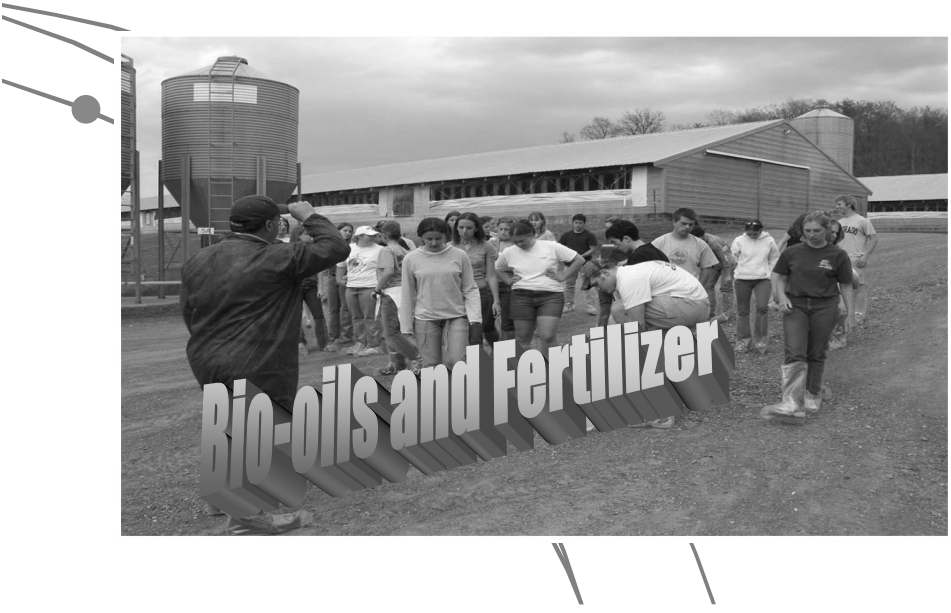




Phytate

Transgenic soybeans expressing an enzyme that degrades phytate for improved P availability

FRALIN BIOTECHNOLOGY CENTER



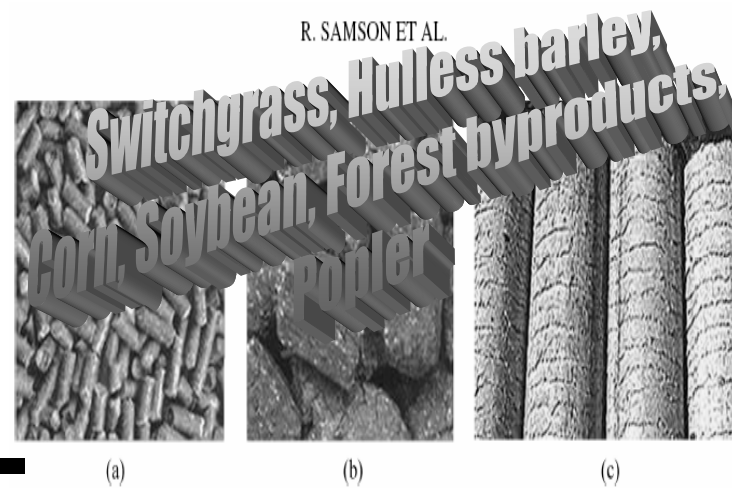
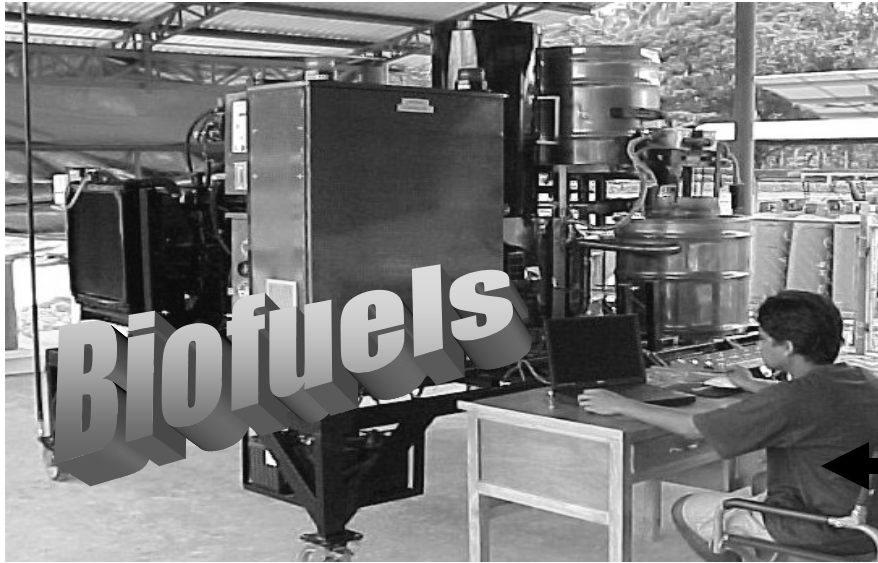
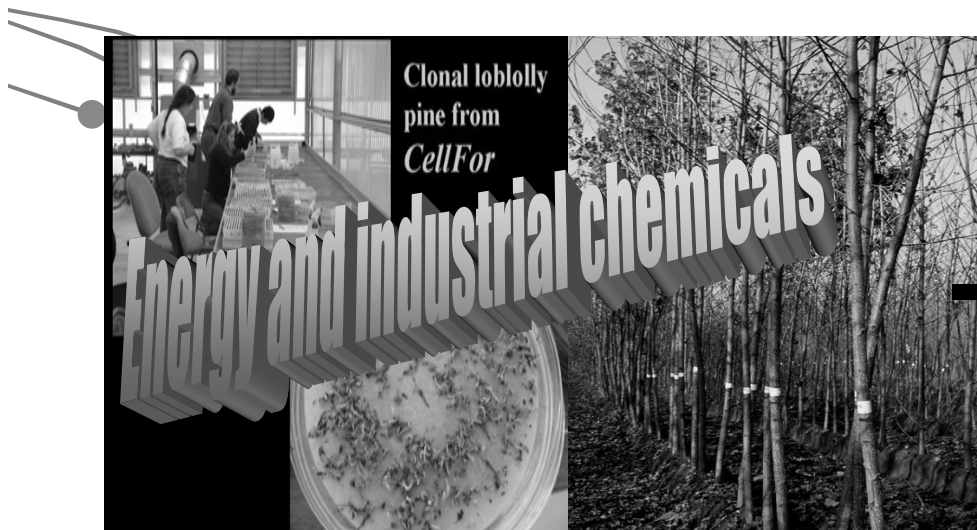



FIG. 4. Densified products from herbaceous biomass (a) Pellets (b) Cubes (c) Briquettes.



Breeding and Transgenics

Enriched foods - Vitamin C

The diagram illustrates the metabolic pathway for the synthesis of L-Ascorbic Acid. It begins with D-Glucose-6P, which is converted to D-Fructose-6P (step 4) and then to D-Mannose-6P (step 5). D-Mannose-6P is further processed to D-Mannose-1P (step 6) and then to GDP-D-Mannose (step 7). GDP-D-Mannose is converted to Methylgalacturonate (step 8) and GDP-L-Galactose (step 9). Methylgalacturonate is converted to D-Galacturonate (step 2), which is then converted to L-Galactonate (step 3). L-Galactonate is converted to L-Galactono-1,4-lactone (step 11), which is then converted to L-Ascorbic Acid (step 12). Other intermediates include L-Galactose-1P (step 10), L-Galactose (step 10), L-Gulose (step 10), D-Glucuronate (step 17), and L-Gulonate (step 18). The enzyme MIOX (myo-Inositol) is involved in the conversion of D-Glucuronate to L-Gulonate (step 18). The diagram also shows the conversion of D-Glucose-6P to D-Glucose-1P (step 13) and then to UDP-D-Glucose (step 14), which is used in the synthesis of UDP-D-Glucuronate (step 15). UDP-D-Glucuronate is converted to D-Glucuronate-1P (step 16), which is then converted to D-Glucuronate (step 17).



Edible soybean

A black and white photograph showing two individuals, an older man and a younger woman, kneeling in a field of soybean plants. They are examining a plant closely, with the woman holding a small white container. The field is filled with rows of soybean plants, and the ground is visible between the rows.

Grains - Wheat and barley

A black and white photograph showing a close-up of wheat and barley stalks. The stalks are tall and thin, with the grain heads clearly visible. The background is slightly blurred, focusing attention on the grain.

Strawberries

A black and white photograph showing a close-up of strawberries. The strawberries are clustered together, with their characteristic shape and texture clearly visible. The background is dark and out of focus.

HEALTH and NUTRITION

(Reducing Obesity/Diabetes/Chronic Diseases)

Plant/Animal Metabolic Engineering (Biodesign)

Foods with more antioxidants.

Grains (wheat)

Soy (isoflavones)

Vegetables (vitamin C)

Fish (Se, Omega 3 fatty acids)

Fruit (apples, grapes, strawberry)

Livestock (pasture and grain fed)

Biochemists

Evaluate properties and mechanisms of action of food chemicals.

Biologists/ Molecular Nutritionists

Determine mechanism of action within cell to reduce oxidative stress - genomics, signaling, modeling, etc.

Human/Animal Nutritionists

Examine how food/nutrients affect factors associated with obesity and diabetes, and physical activity.

Food Scientists

Analyze antioxidant content of food and determine how to supplement and preserve antioxidants during processing.

Economists, Policy

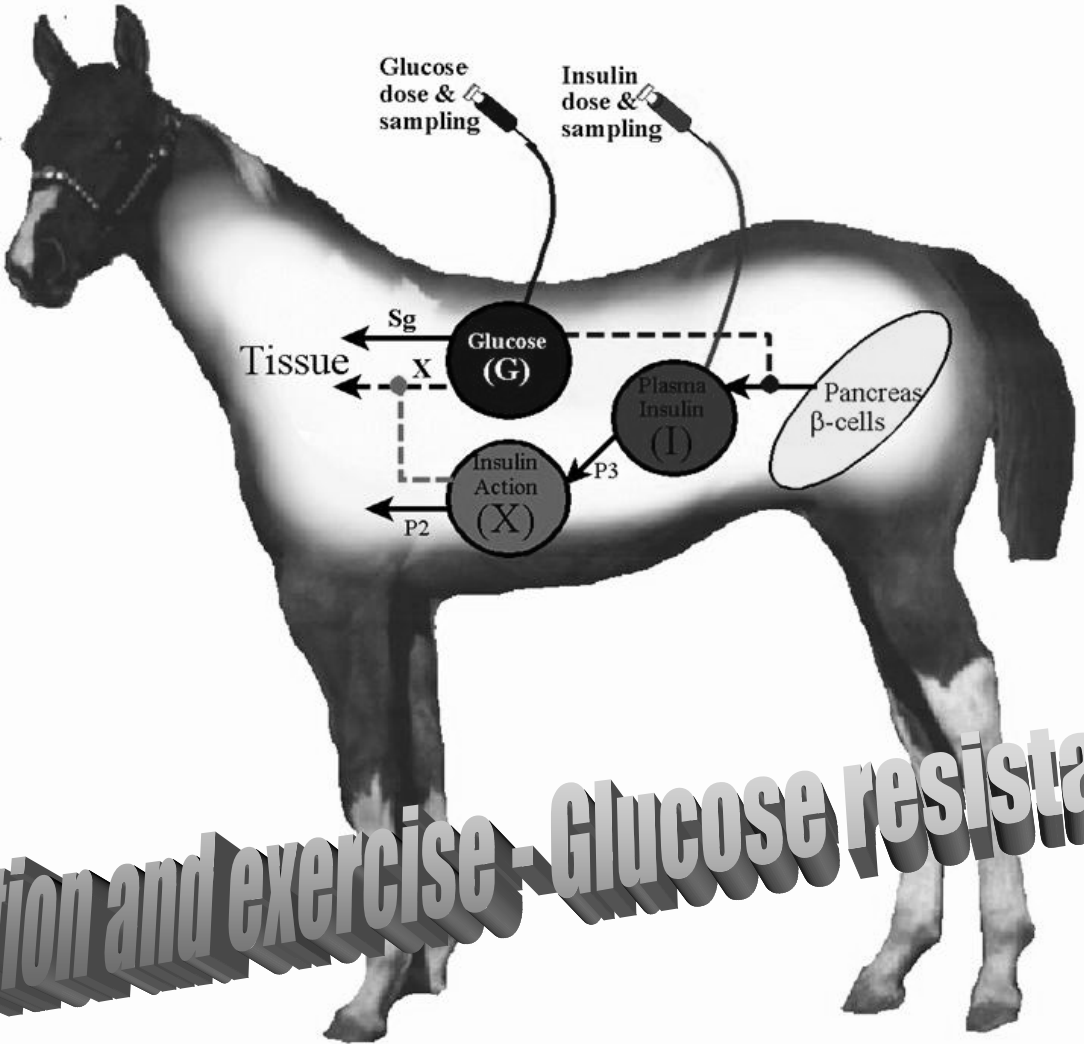
Analysts Assess the impact of economic and policy issues on human consumption.

Behaviorists and Extension

Develop strategies to alter patterns of food consumption and activity to reduce oxidative stress, obesity/diabetes.



Animal Models (Equine, swine, dairy, rodents)



Nutrition and exercise - Glucose resistance

BIOSECURITY

Food Safety and Security



Infectious Diseases

Plants, Animals, and Humans



Avian influenza



Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Engineering disease resistance in peanuts

Add oxalate oxidase gene to disarm the pathogen that causes Sclerotinia blight by degrading oxalic acid

$$\text{Oxalic acid} + \text{O}_2 \rightarrow 2\text{CO}_2 + \text{H}_2\text{O}_2$$

Transgenic peanut field trial

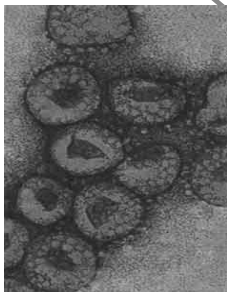
Sclerotinia minor, produces oxalic acid as pathogenicity factor

Lesion assay to test resistance

FRALIN BIOTECHNOLOGY CENTER

Sclerotinia blight

Chronic wasting disease



Engineering resistance to dengue viruses via genetic transformation of the mosquito *Aedes aegypti*

Zach N. Adelman, Entomology

Anti-viral gene is introduced into the mosquito

Inject DNA

Mosquito embryo

Survivors x WT mosquitoes

Screen progeny for fluorescent eyes

Vector-borne diseases

Translational Medicine and Research (TMR)

Infectious Diseases outbreaks
Animal Diseases in Patients
(Animal Models for Human Diseases)



Basic Research
Developments
CVM, CALS, CNR

Veterinary Hospital and
Ambulatory Field Services
(Clinical Environment)



Prevention
Containment
Eradication



Knowledge dissemination and
Practical Clinical Applications
(Translational Medicine) in:

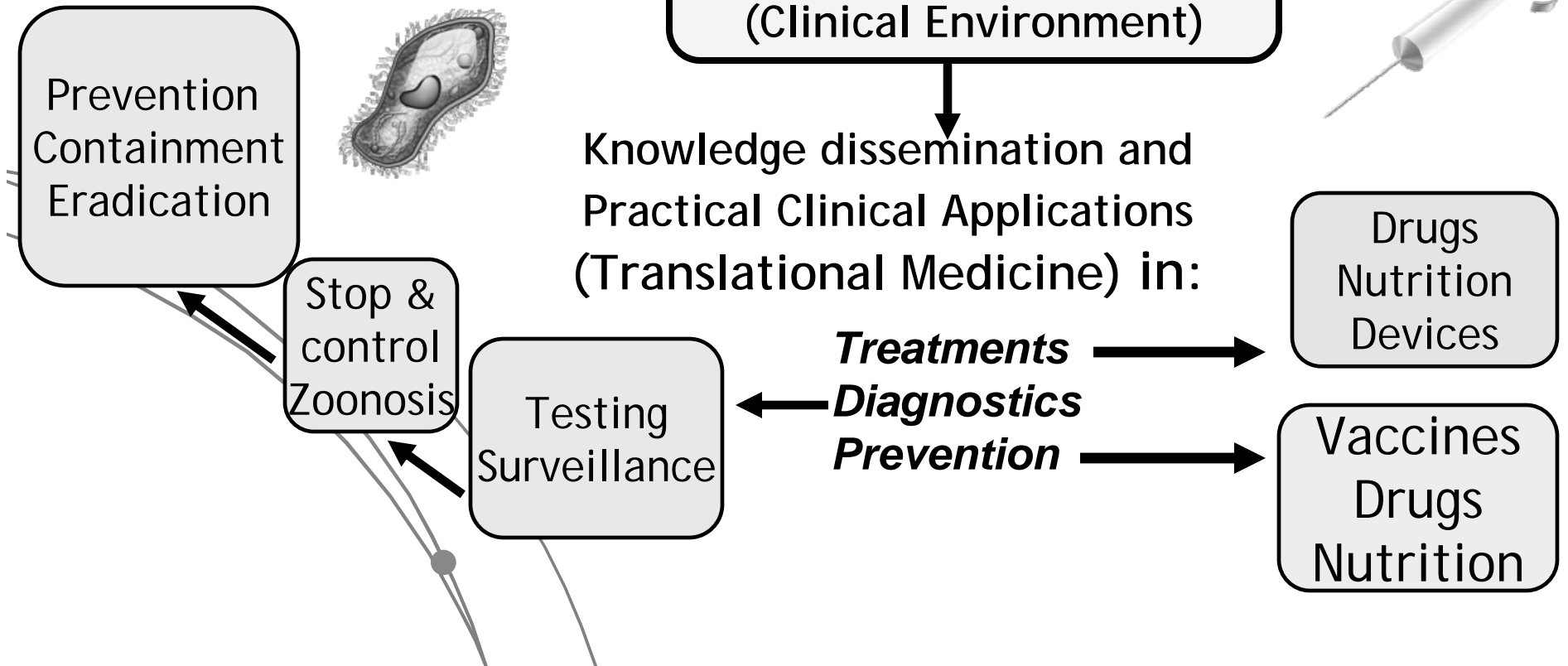
Stop &
control
Zoonosis

Testing
Surveillance

Treatments
Diagnostics
Prevention

Drugs
Nutrition
Devices

Vaccines
Drugs
Nutrition



COMMUNITY ECONOMIC VIABILITY

“Innovation Communities”

Innovation Center for the Development
of a Value-Added Agricultural Economy



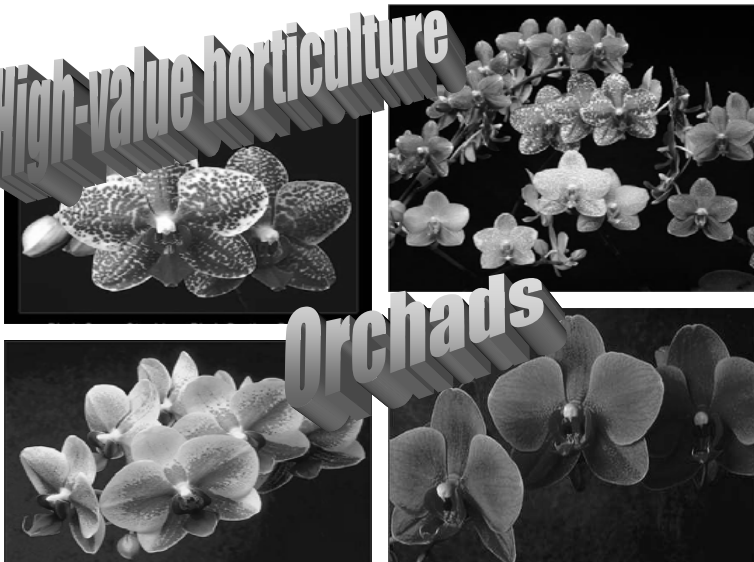
Asset-based Economic Development

Wood Enterprise Institute



Entrepreneurial experience –
Design, manufacture, market

High-value horticulture



Orchids



Product development - Organic dairies



Cellulosic drug carrier

Tomorrow, with the help of Cellulose-based nanomedicine from trees...



TODAY: 4-6 h IV injection;
threat of anaphylactic shock



Produce markets

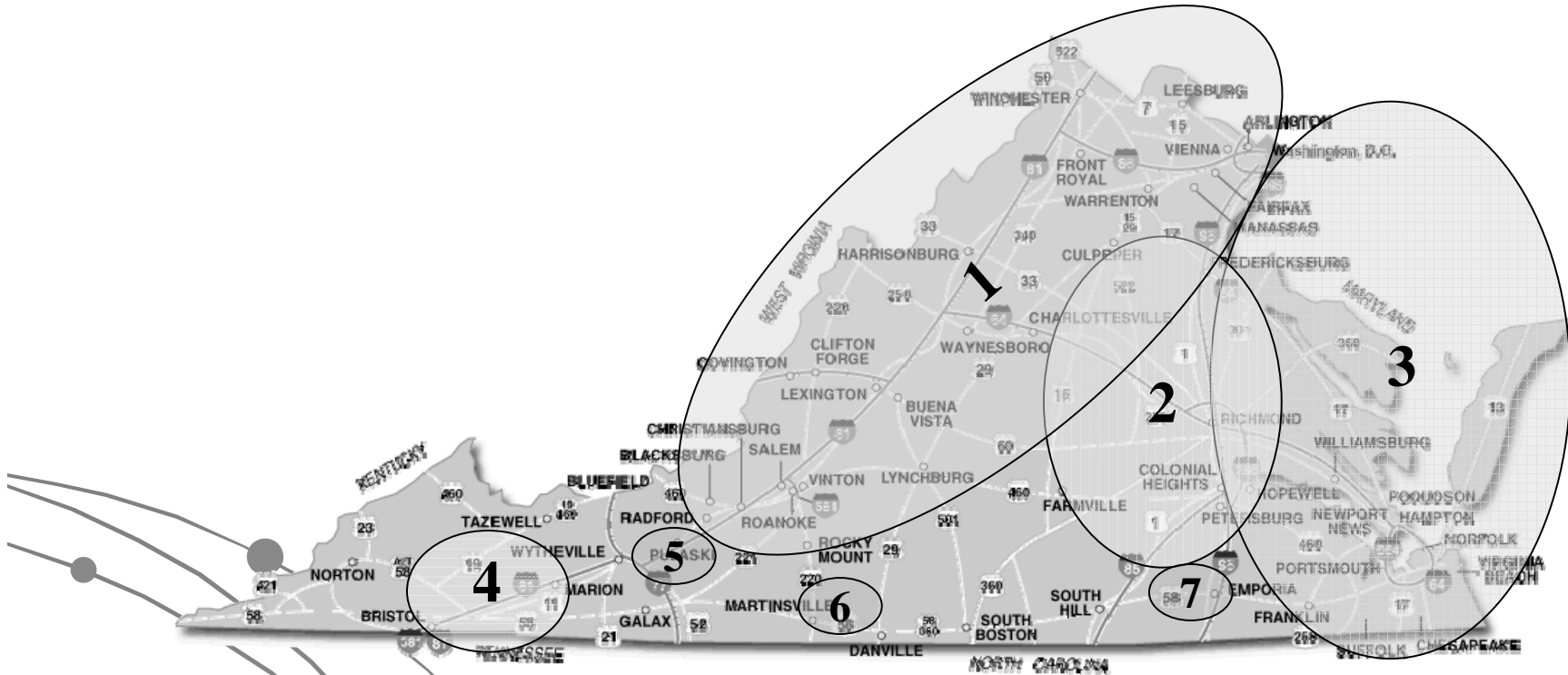
AGRICULTURAL AND NATURAL RESOURCES PROFITABILITY AND ENVIRONMENTAL SUSTAINABILITY (Land preservation and Environmental quality)



Value-Added



Landscape, Nursery, and Greenhouse Industries in Virginia (Value-added)



1. Smaller greenhouse and container nurseries
2. Large greenhouse operations & smaller wholesale nurseries
3. Large greenhouses and wholesale nurseries (mostly container – some field grown)
4. Fraser Fir Christmas Trees
- 5-7 Christmas Trees



Teaching

***“Creating an Economically
Viable and Global Virginia
through Innovation”***

Research

Extension

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