INDEX FOR BULLETINS 304-320
VOLUME XXVI

A

Agricultural Economics Subsection, bulletin from ............................................ 1, 205, 265, 289, 417, 613
“Analysis of mink predation upon muskrats in North-Central United States,” by Paul L. Errington .......................................................... 797
Foreword .............................................................................................................. 799
Summary ............................................................................................................. 800
Introduction ........................................................................................................ 803
Background and methods of study ................................................................. 804
General considerations .................................................................................. 808
Overlapping of habitats of minks and muskrats ........................................ 809
Killing and eating of muskrats by minks ....................................................... 816
Intraspecific strife in muskrat populations .................................................... 822
Drouth and vulnerability of muskrat populations to predations ........ 825
The mechanics of vertebrate predation in North-Central United States .......... 829
Seasonal and special aspects of mink predation upon muskrats ............... 833
The spring dispersal of muskrats and mink predation ............................... 833
Security of breeding muskrats from mink predation .................................. 841
Vulnerability of young muskrats to mink predation .................................... 843
Mink predation upon late summer and early fall muskrat populations .......... 853
Mink predation upon wintering muskrat populations .................................. 865
Intercompensatory aspects of mink predation upon muskrats ................. 876
Intercompensation in “natural” losses of muskrats ...................................... 876
Intercompensation in muskrat losses associated with human activities .......... 884
Economic significance of intercompensatory trends in population phenomena of muskrats ................................................................. 887
Fur management and experimentation with reference to mink-muskrat relationships .......................................................... 888
Discussion ............................................................................................................ 898
Literature cited ................................................................................................ 903
Appendix .............................................................................................................. 908
(A) Scope and technical appraisal of mink-muskrat studies, 1915-42, North-Central United States ......................................................... 908
(B) Observed wounds resulting from intraspecific attacks of Iowa muskrats .......................................................... 916
Addendum on winter and spring predation by minks upon muskrats........ 922
Animal Husbandry Section, bulletin from ..................................................... 105, 489
Autrey, K. M., joint author of “Efficiency of dairy rations containing various quantities of grain” ........................................................................ 105

B

Bird, E. W., joint author of “Chemistry of butter and butter making, V. Methods for determining the pH of cream with standardized acidity and of butter made from this type of cream” ........................................................................ 653
Bob-White. See “Development of a Bob-White management area in southern Iowa” ........................................................................ 697
Breazeale, D. F., joint author of “Chemistry of butter and butter making, V. Methods for determining the pH of cream with standardized acidity and of butter made from this type of cream” ....................... 653
Butter. See “Chemistry of butter and butter making. V. Methods for determining the pH of cream with standardized acidity and of butter made from this type of cream” 653
Butter. See “Water supplies of butter manufacturing plants” 749

C

Cannon, C. Y., joint author of “Efficiency of dairy rations containing various quantities of grain” 105

“Chemistry of butter and butter making. V. Methods for determining the pH of cream with standardized acidity and of butter made from this type of cream,” by C. E. Parmelee, E. W. Bird and D. F. Breazeale 653

Summary and conclusions 656
Introduction 659
Literature review 659
Experimental 661

Equipment 661
Sample preparation 661
Colorimetric pH determination 662
Electrometric pH determination 662

Methods 665
Preparation of reagents and calomel half-cell 665
Preparation of butter sera 666
Colorimetric pH determination 667
Electrometric pH determination 668
Nitrogen determinations 670

Results 670
pH measurements by the quinhydrone and hydrogen electrodes 670
Results with four dairy products 670
Change in pH when samples are diluted with water 670
Analysis of acid-reducing agents employed 672
pH measurements by the colorimetric and quinhydrone electrode methods 672

Cream 672
Butter serum 672

pH measurements by the quinhydrone and glass electrode 673
Change in pH with change in fat content of cream 673
pH values of butter sera from equivalent butter samples melted at different temperatures and held for different lengths of time at these temperatures 676
pH values of butter sera prepared by the field and laboratory methods 676
pH values of butter sera with varying curd contents 677
pH values of butter sera with varying salt contents 679
pH values of cream and of butter serum by the glass and quinhydrone electrodes at different acidity levels when soda-type and lime-type acid-reducing agents are employed 681
pH values by the glass electrode at different temperatures 685
Asymmetry potential changes of the glass electrode 685

Literature cited 686
Tables 687

Cochran, W. G., author of “Some additional lattice square designs” 729
Corley, R. T., joint author of “Water supplies of butter manufacturing plants” 749

D

Dairy Husbandry Subsection, bulletin from 105
Dairy Industry Section, bulletin from 653, 749
Summary .............................................................................................................. 701
Introduction .......................................................................................................... 703
Methods of research .............................................................................................. 706
General Bob-White food and cover conditions ................................................... 706
Agricultural crops and Bob-White management .................................................. 707
Small grains ........................................................................................................... 708
Meadow ................................................................................................................ 708
Pasture .................................................................................................................. 709
Sorghum, millet, legumes and fallow .................................................................... 709
Livestock and Bob-White management on the area .............................................. 710
Game management practiced by the farmers ........................................................ 711
Season of 1936 ...................................................................................................... 711
Season of 1937 ...................................................................................................... 715
Seasons of 1938 and 1939 .................................................................................... 717
Bob-White population fluctuations .................................................................... 718
Census and population estimates .......................................................................... 718
Bob-White population fluctuations and climatological data ................................ 720
Winter survival ...................................................................................................... 720
Rearing seasons of 1937, 1938 and 1939 .............................................................. 722
Bob-White breeding potential and productivity ................................................... 723
Farmer-sportsman relationships .......................................................................... 724
Literature cited ...................................................................................................... 726
Diebold, Peter, joint author of “Demand for fats and oils in the soap industry” 417
Dove, mourning. See “Ecology and management of the mourning dove” 353
Zenaidura macroura (Linn.), in Cass County, Iowa ............................................ 353

E

“Economic problems of low income farmers in Iowa,” by Lawrence W. Witt 205
Summary .............................................................................................................. 206
Introduction .......................................................................................................... 211
Review of literature ............................................................................................... 213
Sources of the data ............................................................................................... 217
Organization of the data into income groups ...................................................... 218
Income status and family characteristics of low-income farmers ...................... 219
Income distribution ............................................................................................. 219
Tenure .................................................................................................................. 220
Age and size of family ......................................................................................... 221
Types of farmers .................................................................................................. 222
Incomes and expenditures of various income groups ......................................... 223
Sources of income ............................................................................................... 223
Agricultural products ......................................................................................... 223
Benefit payments ................................................................................................. 225
Home used products ............................................................................................ 225
Other income ....................................................................................................... 226
Average expenditures ......................................................................................... 226
Characteristics of land operated by Iowa farmers at various income levels .... 228
Farm acreage operated ......................................................................................... 228
Quality of land .................................................................................................... 229
Characteristics of capital equipment and value at various income levels ......... 232
Livestock-inventories ......................................................................................... 233
Machinery, automobiles and trucks .................................................................... 233
Buildings ............................................................................................................. 236
Total capital managed ....................................................................................... 236
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equities</td>
<td>237</td>
</tr>
<tr>
<td>Labor and entrepreneurial ability</td>
<td>240</td>
</tr>
<tr>
<td>Labor supply</td>
<td>241</td>
</tr>
<tr>
<td>Medical bills</td>
<td>243</td>
</tr>
<tr>
<td>Farm practices</td>
<td>243</td>
</tr>
<tr>
<td>County agent contacts</td>
<td>245</td>
</tr>
<tr>
<td>Newspapers, magazines, radio and bulletins</td>
<td>245</td>
</tr>
<tr>
<td>Comparisons with farm security administration clients</td>
<td>246</td>
</tr>
<tr>
<td>Efficiency of farm operations</td>
<td>247</td>
</tr>
<tr>
<td>Effects of action programs</td>
<td>251</td>
</tr>
<tr>
<td>Agricultural adjustment administration</td>
<td>252</td>
</tr>
<tr>
<td>Farm security administration</td>
<td>253</td>
</tr>
<tr>
<td>Extension service</td>
<td>256</td>
</tr>
<tr>
<td>War program and increasing demand</td>
<td>256</td>
</tr>
<tr>
<td>Literature cited</td>
<td>258</td>
</tr>
<tr>
<td>Appendix tables</td>
<td>260</td>
</tr>
<tr>
<td>“Ecology and management of the mourning dove, Zenaidura macroura</td>
<td>353</td>
</tr>
<tr>
<td>(Linn.), in Cass County, Iowa,” by H. Elliott McClure</td>
<td></td>
</tr>
<tr>
<td>Summary</td>
<td>356</td>
</tr>
<tr>
<td>Introduction</td>
<td>357</td>
</tr>
<tr>
<td>Life history</td>
<td>361</td>
</tr>
<tr>
<td>Production during 1938, 1939, 1940</td>
<td>361</td>
</tr>
<tr>
<td>Nesting habits</td>
<td>367</td>
</tr>
<tr>
<td>The young</td>
<td>387</td>
</tr>
<tr>
<td>Decimating factors</td>
<td>391</td>
</tr>
<tr>
<td>Food habits</td>
<td>398</td>
</tr>
<tr>
<td>Parasites</td>
<td>406</td>
</tr>
<tr>
<td>Migration</td>
<td>407</td>
</tr>
<tr>
<td>Management</td>
<td>410</td>
</tr>
<tr>
<td>Literature cited</td>
<td>413</td>
</tr>
<tr>
<td>“Efficiency of dairy rations containing various quantities of grain,”</td>
<td>105</td>
</tr>
<tr>
<td>by K. M. Autrey, C. Y. Cannon and D. L. Espe</td>
<td></td>
</tr>
<tr>
<td>Summary and conclusions</td>
<td>108</td>
</tr>
<tr>
<td>Review of literature</td>
<td>109</td>
</tr>
<tr>
<td>Experimental procedure</td>
<td>111</td>
</tr>
<tr>
<td>First trial</td>
<td>111</td>
</tr>
<tr>
<td>Second trial</td>
<td>112</td>
</tr>
<tr>
<td>Results</td>
<td>114</td>
</tr>
<tr>
<td>First trial</td>
<td>114</td>
</tr>
<tr>
<td>Second trial</td>
<td>118</td>
</tr>
<tr>
<td>Dry matter consumption</td>
<td>118</td>
</tr>
<tr>
<td>Total digestible nutrient consumption</td>
<td>123</td>
</tr>
<tr>
<td>Protein and crude fiber consumption</td>
<td>125</td>
</tr>
<tr>
<td>Milk production</td>
<td>125</td>
</tr>
<tr>
<td>Physiologic efficiency</td>
<td>131</td>
</tr>
<tr>
<td>Regression of milk production on size of animal and dry matter</td>
<td>133</td>
</tr>
<tr>
<td>consumption</td>
<td>134</td>
</tr>
<tr>
<td>Economic efficiency</td>
<td>134</td>
</tr>
<tr>
<td>Discussion of results</td>
<td>136</td>
</tr>
<tr>
<td>Literature cited</td>
<td>139</td>
</tr>
<tr>
<td>Entomology and Economic Zoology Section, bulletin from</td>
<td>353, 697, 797</td>
</tr>
<tr>
<td>Errington, Paul L., author of “Analysis of mink predation in North-</td>
<td></td>
</tr>
<tr>
<td>Central United States”</td>
<td></td>
</tr>
<tr>
<td>Espe, D. L., joint author of “Efficiency of dairy rations containing</td>
<td>105</td>
</tr>
<tr>
<td>various quantities of grain”</td>
<td></td>
</tr>
<tr>
<td>“Factor in oat hulls essential for the growth of chicks,” by Paul R.</td>
<td>489</td>
</tr>
<tr>
<td>Record</td>
<td></td>
</tr>
</tbody>
</table>

F
Inoculation of nursery seedbeds ........................................... 588
Nutrient absorption by inoculated and uninoculated pine ........ 588
Responses of jack pine to nitrogen and phosphorus ................ 594
Growth of jack pine on several surface soils .......................... 598
Effect of soil inoculation and fertilization on the root systems of pine ................................................................. 598
Discussion ................................................................................ 602
Summary ...................................................................................... 609
Literature cited ............................................................................. 610

Oat hulls. See “Factor in oat hulls essential for the growth of chicks” .... 489

Parmelee, C. E., joint author of “Chemistry of butter and butter making. V. Methods for determining the pH of cream with standardized acidity and of butter made from this type of cream” ........................... 653
Poultry Husbandry Subsection, bulletin from .................................... 489
“Problems of beginning farmers in Iowa,” by J. A. Starrak .................. 513
Summary ...................................................................................... 516
Major problems and their solutions ........................................... 516
The degree of success achieved ................................................. 517
Extent and nature of formal education ....................................... 517
Conclusions .................................................................................. 518
Recommendations ........................................................................ 518
Nature and scope of the investigation ......................................... 519
Number and location of farmers interviewed ............................... 519
Personal data on farmers interviewed ........................................ 521
Ages of farmers ........................................................................... 521
Where farmers were reared ....................................................... 521
Mobility of young farmers .......................................................... 521
Current occupational status of fathers ...................................... 521
Age of fathers ............................................................................. 522
Education of fathers .................................................................. 522
Fathers’ occupational history ...................................................... 522
Current occupations of brothers ............................................... 522
The findings of the investigation .................................................. 523
Outstanding problems and difficulties ....................................... 523
Difficulty ranking of the problems encountered ....................... 523
Major difficulties reported in each problem area ....................... 524
Ways and means of solving problems ........................................ 533
Solving financial problems ....................................................... 533
Solving the problem of obtaining land ....................................... 537
Solving problems of obtaining livestock ..................................... 539
Solving production problems ...................................................... 539
Solving equipment problems ...................................................... 540
Solution of housing problems ..................................................... 541
Solving management problems .................................................. 543
Progress in solving problems ...................................................... 544
Size and value of farms currently occupied ............................... 544
Tenure status on present farm .................................................... 545
Improvements made upon the land .......................................... 546
Improvements made on farmstead ............................................. 548
Production of crops and animals ................................................. 550
Improved farm practices ............................................................. 550
Progress in farming ..................................................................... 551
The relative value of the factors contributing to success in becoming established in farming ........................... 552
Formal educational experiences ........................................ 552
Types of schools attended ................................................ 553
Educational status ......................................................... 554
Current attitude toward education ....................................... 554
School subjects of greatest value ...................................... 554
School activities of greatest value ..................................... 555
Education in agriculture ................................................. 556
Systematic instruction in non-agricultural occupations .......... 556
Occupational experiences of young farmers ......................... 566
Non-farming occupational experiences ............................. 567
Farming experiences ..................................................... 567
Relationship of beginning tenant farmers to owners ............. 571
Patterns of occupational experience ................................ 572
The effect of instruction in vocational agriculture upon the progress made by beginning farmers ................. 573
Differences with critical ratios of 3.0 or greater .................. 574
Differences with critical ratios from 2.0 to 3.0 ..................... 575
Differences with critical ratios of less than 2.0 ....................... 578

R
Record, Paul R., author of “Factor in oat hulls essential for the growth of chicks” ........................................ 489
Rural Education Subsection, bulletin from .............................. 513
Rural Social Science Section, bulletin from ............................. 141, 205, 265, 289, 417, 513, 613
Rural Sociology Subsection, bulletin from ............................. 141, 205
Ryan, Bryce, author of “Social and ecological patterns in the farm leadership of four Iowa townships” .......... 141

S
Sanders, Earl, author of “Development of a Bob-White management area in Southern Iowa” ......................... 697
Seedlings, pine. See “Mycorrhizae and phosphorus nutrition of pine seedlings in a prairie soil nursery” .......... 581
Soap. See “Demand for fats and oils in the soap industry” ...... 417
“Social and ecological patterns in the farm leadership of four Iowa townships,” by Bryce Ryan ............................. 141
Introduction ........................................................................ 145
Purpose ............................................................................... 145
The locality studied .......................................................... 146
Method ............................................................................... 147
Types of leadership studied .............................................. 148
The problems ....................................................................... 149
Diversity and agreement in the selection of leaders ............... 151
Ability to select leaders ..................................................... 151
Diversity and agreement in the selection of specific leaders .... 152
The four townships combined ............................................ 153
The Fontanelle community ................................................... 155
The individual townships .................................................... 157
The versatility of leaders ................................................... 158
Spatial patterns in leadership ............................................. 162
Leaders residing in towns and in open country ................. 162
Leadership areas ............................................................. 163
The social relationships between followers and leaders ......... 166
Intimacy ............................................................................. 166
Types of relationships between followers and leaders ......... 168
Relationships to major and minor leaders........................................... 173
The official capacities of leaders ......................................................... 175
Conclusions ......................................................................................... 176
Appendix tables .................................................................................. 181
"Some additional lattice square designs," by W. G. Cochran ................. 729
Introduction ........................................................................................ 731
1. Properties of the designs ................................................................. 732
2. Field layout and randomization ...................................................... 733
3. Statistical analysis ......................................................................... 738
4. Estimation of the standard errors ................................................... 742
5. Loss of efficiency due to asymmetry ................................................. 745
Summary ............................................................................................. 747
References cited .................................................................................. 748
"Some investigations on the suitability of the township as a unit for
sampling Iowa agriculture," by Norman V. Strand and Raymond J.
Jessen ...................................................................................................... 613
Summary and conclusions ................................................................. 616
Introduction ......................................................................................... 617
The data ................................................................................................ 618
Procedure .............................................................................................. 618
Sample expansion ................................................................................ 618
The individual farm as a sampling unit for the county ......................... 619
The minor civil division (township) as a sampling unit for the county ... 620
Method I ................................................................................................. 621
Method II ............................................................................................... 622
Method III ............................................................................................. 627
Method IV ............................................................................................. 626
Method V ............................................................................................... 626
Method VI ............................................................................................. 627
Method VII ........................................................................................... 628
Method VIII .......................................................................................... 628
Method IX ............................................................................................. 628
Method X ............................................................................................... 628
Method XI ............................................................................................. 629
Method XII ............................................................................................ 630
Method XIII .......................................................................................... 631
Method XIV .......................................................................................... 632
Method XV ............................................................................................ 633
Method XVI .......................................................................................... 633
Method XVII ........................................................................................ 633
Method XVIII ....................................................................................... 634
The township as a sampling unit for a crop-reporting district .......... 634
The matched farm as a sampling unit for the county ......................... 637
Sampling efficiencies of different stratifications of counties ............... 638
Literature cited and references ............................................................ 641
Appendix ............................................................................................... 642
Starrak, J. A., author of "Problems of beginning farmers in Iowa" .......... 513
"Statistical comparison of record-keeping farms and a random sample of
Iowa farms for 1939," by John A. Hopkins ......................................... 265
Summary .............................................................................................. 266
Comparisons of type-size averages ..................................................... 268
Comparisons of gross income by size-type groups ............................. 269
Comparison of net farm income by size-type groups ......................... 271
Relative investments on record as compared to random sample farms 273
Amount of labor used on record farms as compared to random sample 274
Acreage and yield of corn compared .................................................. 277
Sales of livestock ................................................................................ 278
Comparison of expenses .................................................................... 280
"Statistical investigation of a sample survey for obtaining farm facts," by Raymond J. Jessen

Summary and conclusions

Introduction

Statement of the problem

Description of the surveys

Enumeration procedure

General discussion on the questionnaires and on field operations

The data

Errors due to the vagaries of sampling

Methods of estimating state totals from the sample

Comparative precision of the three methods of estimation

Measuring year-to-year differences and percentage changes

Discussion—a digression

Year-to-year changes as percentage changes

Errors

Errors in data taken by interview

Discrepancies between reports to the township assessor and the sample survey enumerator

Bias which may result from sampling procedure

Discussion on errors in data taken by interview

Effect of stratification (complete) on sampling efficiency

Efficiency in the allocation of the sampling units between and within counties: incomplete stratification or sub-sampling

Homogeneity of variances

The problem of maximizing amount of information obtainable from a given expenditure by varying size of the sampling unit and the number taken

A variance function

A cost function for sample surveys

Efficiency of incomplete matching

Literature cited and references

Appendix A

Estimates of sampling errors for samples of different sampling units and cost situations

Appendix B

The questionnaires

Appendix C

Comparison of the 1939 sample survey with the 1940 federal census, Iowa state farm census (assessor) and the Agricultural Marketing Service

Appendix D

Quarter-section grid count

Appendix E

Statistics of agriculture in the incorporated areas of Iowa

Strand, Norman V., joint author of "Some investigations on the suitability of the township as a unit for sampling Iowa agriculture"

"Twenty-one years of Iowa farm records," by John A. Hopkins

Summary

General trends of receipts from 1920 to 1940

Comparison of record farms with the Iowa average

Comparison by areas

Trends in gross and net income
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trends in expenses</td>
<td>307</td>
</tr>
<tr>
<td>Trends in valuation of assets</td>
<td>309</td>
</tr>
<tr>
<td>Comparisons by types of farms</td>
<td>312</td>
</tr>
<tr>
<td>Type of farm and percentage of land in corn</td>
<td>314</td>
</tr>
<tr>
<td>Type of farm related to size</td>
<td>316</td>
</tr>
<tr>
<td>Trends in gross and net income</td>
<td>316</td>
</tr>
<tr>
<td>Variations in expense elements by types of farms</td>
<td>318</td>
</tr>
<tr>
<td>Variations in capital between types</td>
<td>320</td>
</tr>
<tr>
<td>Returns on livestock per $100 of feed fed to productive livestock</td>
<td>322</td>
</tr>
<tr>
<td>Effect of mechanization on farm expenses</td>
<td>323</td>
</tr>
<tr>
<td>Variations in returns and investments by size of farm</td>
<td>326</td>
</tr>
<tr>
<td>Trends in gross and net income by size of farm</td>
<td>327</td>
</tr>
<tr>
<td>Trends in value of assets by size of farm</td>
<td>329</td>
</tr>
<tr>
<td>Trends in income and expense element</td>
<td>330</td>
</tr>
<tr>
<td>Appendix</td>
<td>333</td>
</tr>
</tbody>
</table>

**W**


Summary and conclusions ............................................. 752
Introduction ..................................................................... 753
Historical .......................................................................... 754
Sources of samples ......................................................... 761
Methods ............................................................................. 762
Collection and shipment of samples .................................... 762
Tests for *Escherichia-Aerobacter* organisms .......................... 762
Bacterial counts .................................................................. 762
Isolation of *Ps. putrefaciens* ........................................ 763
Experimental churnings ...................................................... 763
Interpretation of keeping quality tests ................................ 763
Experimental ....................................................................... 764
Various bacteriological conditions encountered in water supplies... 764
  Satisfactory water from well ........................................ 764
  Satisfactory water from well or tank ................................ 764
  Satisfactory water from well but contaminated in tank ........ 764
  Unsatisfactory water from well ....................................... 765
  Unsatisfactory water from well or tank ............................ 765
  Unsatisfactory water from well and further contaminated in tank 766
  Variation in bacteriological condition of water supplies ...... 766
  Samples not yielding coliform organisms and with low counts on nutrient agar but unsatisfactory for butter manufacture 767
  Unsatisfactory municipal water supplies ........................... 767
Coliform organisms in water supplies ................................... 768
  Distribution of coliform organisms in water from wells, storage tanks and municipal sources .......................... 768
  Relationships between distribution of coliform organisms in water and total bacterial counts on the water .................. 769
  Distribution of coliform organisms in water and in experimental butter washed with it ...................................... 769
  Comparison of standard lactose broth and tryptose lauryl-sulfate broth as presumptive media for detecting coliform organisms in water ............................................. 770
  Identification of coliform organisms found in water .......... 771
Total bacterial counts on water supplies ................................ 771
Comparison of average total bacterial counts made under various conditions ............................................. 771
Relationship of total bacterial counts on water to deterioration in butter washed with it ........................................ 772
Organisms of the genus *Pseudomonas* in water supplies .......... 772
Relationship of *Ps. putrefaciens* in water to coliform organisms, to total bacterial counts, and to butter spoilage.... 772
Relationship of presence of various *Pseudomonas* species in water to spoilage in butter washed with it ............... 773
Examination of miscellaneous water samples ......................... 774
General considerations .......................................................... 776
Suggested bacterial standards for butter plant water supplies .......... 777
Literature cited ........................................................................... 779
Witt, Lawrence W., author of “Economic problems of low income farmers in Iowa” ............................................. 205