

Importance of Mechanical Activities Performed by Outstanding Young Farmers In Mississippi

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Significant changes are occurring in the workplace, and these changes must be reflected in the vocational education curriculum. A task force of the American Vocational Association (1981) developed a national agenda for vocational education which identified remaining current in the technical subject area as a major concern among vocational educators. More recently, a national study on vocational education placed the topic of "Keeping up with technological changes" third on a list of 60 topics of concern (Zellner & Parrish, 1986).

Vocational agriculture faces a similar challenge to meet the needs of the changing agricultural industry. Curriculum content rapidly becomes obsolete and should be changed as needed. Weston (1959) conducted a study of mechanical jobs performed by selected farmers in Missouri. Weston's instrument has been modified and used by Knott (1971), Shinn (1971) and Long (1981) to survey the mechanical skills needed by farmers.

Purpose and Objectives

This study was designed as a quasi-replication of the research of Weston (1959) and Long (1981) to evaluate current practices among young farmers in Mississippi. The primary research question was "What are the important mechanical tasks which are performed by successful young farmers?" The successfulness of each young farmer was determined by the local Jaycee chapters in each community using the guidelines performed by the state Jaycee association. Specifically, four research questions were developed.

1. What mechanical tasks are performed on farms owned or operated by successful young farmers in Mississippi?
2. Among those tasks performed, what is the level of importance as perceived by successful young farmers as determined by the Mississippi Jaycees?
3. Does the nature of farming operations affect the importance or the frequency of the performed tasks?
4. To what extent is there agreement as to the importance of agricultural mechanical competencies between Mississippi and Missouri Young Farmers?

Procedures

This study surveyed young farmers who were selected by local Jaycee chapters to participate in the Outstanding Young Farmer Awards Program in Mississippi. An Outstanding Young Farmer (OYF) is defined as a farmer between the ages of 18 and 35 who has demonstrated superior

knowledge worthy of recognition in the community. The population included 82 OYF who were selected by local Jaycee chapters from 1977 through 1982. A random sample of 50 OYF was sent an individualized cover letter, survey instrument, demographic data sheet and a stamped return envelope. A follow-up letter was sent to the non-respondents. Attempts were made to contact the remaining non-respondents by phone. Non-respondents were not compared to respondents. Thirty-seven usable instruments (74%) were included in the final analysis.

A list of 108 mechanical activities, subdivided into five parts, was adapted from the instrument used by Long (1981). These five parts were: farm power and machinery (33 activities), construction and maintenance (29 activities), structures and environment (22 activities), electric power and processing (12 activities), and soil and water management (12 activities). Respondents were asked if the activity was performed on their farm. If they answered yes, respondents were asked to rate on a scale from 1 (low) to 6 (high) the importance of each activity to the success of the operation. A modified form of this instrument had been used in previous research with satisfactory results (Knott, 1971; Long, 1981; Shinn, 1977; Weston, 1959).

Results

Means and standard deviations were computed for each mechanical activity for the overall sample and for each of the three farm production enterprise subgroups (crops only, livestock only, and both crops and livestock).

Demographic data were collected to provide an introduction and overview of the sample of OYF. Respondents were typically in the upper age range (31.5 years) of the population and were involved in a single proprietorship.

There was a broad range in the number of areas of both owned and rented land among the OYF included in the study. The 37 OYF managed an average of 1,460 acres with a mean of 697 acres owned and 763 acres rented. Those with crop enterprises reported managing 1,763 acres with 916 acres owned and 847 acres rented. Those with both crop and livestock enterprises reported managing 1596 acres with a mean of 733 owned and 863 rented acres.

Soybeans was the most frequently crop grown among the 37 OYF (94%). Beef cow and calf operations were the most frequent livestock enterprises reported by livestock producers (54%). Fourteen OYF farmers produced wheat and cotton; however, cotton enterprises involved more acres. Five OYF reported a hog or dairy enterprise. Broiler and catfish enterprises were each reported once.

When asked about educational preparation, all OYF reported high school completion. Two reported additional vocational training; 6 completed 2 years of college, and 19 of the 37 OYF (51%) reported a baccalaureate degree or higher. Those with a degree reported major fields of study in agricultural and extension education, agricultural economics, agricultural engineering, animal science, forestry, entomology, industrial education, business, history, psychology and social work. Associate degrees were reported in business and physical education.

Young farmers with both crop and livestock enterprises reported a mean of 2.6 full-time and 1.3 part-time employees in their farming operations. Those with crop enterprises reported a mean of 2.1 full-time and 3.0 part-time employees. Livestock producers reported 1.8 full-time and 0.2 part-time employees. The range of employees employed by the 37

OYF was from 0 to 15 full-time and 0 to 6 part-time employees. The OYF with the 400-cow dairy operation reported the most farm labor.

Power and Machinery Activities

Table 1 provides a rank order using the means of each of the 33 power and machinery activities included in the study. For these analyses, an arbitrary cutoff was established at the 3.0 level on the scale. Twenty-seven of the power and machinery activities (82%) were rated above the 3.0 cutoff value.

Table 1

Means of Power and Machinery Activities Performed by OYF by Enterprise

Mechanical Activities	All n=37	Both n=22	Crop n=10	Livestock n=5
Change crankcase oil and filter	5.8	5.8	6.0	5.6
Service air cleaner	5.7	5.7	5.7	5.4
Calibrate & adjust plant equip	5.6	5.7	6.0	4.6
Lube tractor	5.5	5.5	5.8	5.4
Calibrate spray equipment	5.5	5.8	6.0	3.4
Adjust harvest equipment	5.5	5.8	6.0	3.4
Adjust implements	5.5	5.5	5.4	5.4
Repair and replace broken machine parts	5.4	5.5	5.2	5.4
Adjust tillage equipment	5.3	5.2	5.9	4.4
Maintain batteries	4.9	4.8	5.1	4.8
Maintain farm trucks	4.8	5.0	4.3	5.0
Maintain cooling system	4.8	5.0	5.1	3.4
Repack wheel bearing	4.6	4.9	5.0	2.6
Adjust clutch	4.3	5.1	3.6	2.4
Maintain hydraulic system	4.2	4.1	4.2	4.6
Maintain safety devices	4.0	3.9	4.4	3.6
Troubleshoot diesel engine	3.9	3.8	4.0	4.2
Troubleshoot gas engine	3.8	3.8	4.0	3.8
Adjust brakes	3.8	4.1	3.6	2.4
Maintain exhaust system	3.6	3.9	3.5	2.8
Tune-up gas engine	3.6	3.7	3.8	2.4
Maintain & repair fuel system	3.6	4.0	2.9	2.8
Adjust & repair gas engine	3.4	3.4	3.7	2.6
Repair tire	3.3	3.9	3.6	0.2
Repair electrical system	3.3	3.4	3.2	3.2
Paint machines & equipment	3.1	2.9	3.8	2.6
Size pulleys & belts	3.0	2.8	3.7	2.4
Diagnose diesel pump	2.9	3.1	2.7	2.4
Overhaul gas engines	2.5	2.8	3.1	0.0
Maintain & repair air conditioning	2.0	1.7	2.7	1.2
Tune-up diesel engines	1.9	1.7	3.1	0.0
Install radio equipment	1.9	2.2	1.6	1.0
Overhaul diesel engine	1.6	1.5	2.4	0.0

When compared with the overall group, those respondents with both crop and livestock enterprises rated the diagnosis of diesel injector pump problems higher. This subgroup rated maintenance and repair of fuel delivery systems below the 3.0 value. The crops only subgroup rated overhaul of gasoline engines higher than the sample. However, this subgroup rated maintenance and repair of the fuel system lower than the cutoff value. The five young farmers included in the livestock only subgroup rated 10 of the 27 activities (44%) below the cutoff score.

Construction and Maintenance Activities

Table 2 lists the means of construction and maintenance activities as perceived by young farmers. Twenty-two of the 29 construction and maintenance activities (88%) were judged important by the respondents. This listing included competencies in materials selection, general safety, arc welding, gas welding and cutting, tool redressing, and fence repair. There was some disagreement between the overall sample and young farmers involved with both crop and livestock enterprises. This

Table 2

Means of Construction and Maintenance Activities Performed by OYF by Enterprise

Mechanical Activities	All n=37	Both n=22	Crop n=10	Livestock n=5
Arc welding	5.1	5.2	5.7	3.8
Oxy-acetylene cutting	5.0	5.0	5.7	4.0
Operate equipment safely	5.0	5.1	5.2	4.4
Follow safety procedures	5.0	4.7	5.7	5.2
Use hand tools safely	4.9	4.7	5.2	5.0
Maintain shop equipment	4.3	4.2	4.7	4.0
Oxy-acetylene welding	4.3	4.0	5.3	3.6
Determine materials	4.1	4.2	4.7	4.0
Maintain-repair fence	4.1	4.8	2.6	4.4
Maintain farm service center	4.1	3.8	4.9	3.4
Select weld supplies	4.1	3.9	5.0	3.0
Construct corral-fence	4.0	4.6	2.1	4.8
Sharpen machine blades	4.0	3.8	4.4	4.0
Construct devices	3.8	3.6	4.6	3.8
Select welding supplies	3.8	3.6	4.7	3.0
Maintain farm shop	3.7	3.4	4.1	3.8
Construct metal project	3.5	3.7	2.4	3.6
Construct wood project	3.4	3.3	2.6	4.0
Sharpen drill bit, etc.	3.4	3.5	3.6	3.8
Maintain tool inventory	3.3	2.8	4.2	3.2
Maintain hand power tool	3.2	2.7	3.9	4.2
Use spray paint equipment	2.4	2.0	3.7	1.6
Construct farm implement	2.4	2.0	3.1	2.4
Construct trailer-wagon	2.1	1.9	2.6	2.2
Rope knots, halters	1.9	1.8	2.1	2.2
Make project drawing	1.6	0.7	2.7	3.2
MIG welding	0.5	0.5	1.0	0.0
Maintain paint room	0.5	0.4	1.3	0.8
TIG welding	0.3	0.1	0.9	0.0

subgroup of 22 OYF rated maintenance of hand-power tools and maintaining tool inventories as less important. Young farmers involved with crop enterprises rated four activities lower than the sample: repair of fences, construction of corrals and fences, and construction of both wood and metal projects.

Structures and Environment Activities

Table 3 provides a listing of the structures and environment activities and the mean values. Using the consensus of 37 OYF, 6 of the 22 structures and environment activities (27%) were above the cutoff value of 3.0. The areas included selecting materials, building maintenance and light construction. There was general agreement between the overall sample and young farmers with both crop and livestock enterprises. Young farmers who grew only crops rated repair and maintenance of grain or forage handling equipment lower than the sample. The maintenance of water wells and pumps and planning the farmstead layout were identified as an important activity by the livestock only subgroup. This subgroup rated repair and maintenance of grain/forage handling equipment, selection of materials to construct farm building, and construction of small farm buildings lower than the sample.

Table 3

Means of Structures and Environment Activities Performed by OYF by Enterprise

Mechanical Activities	All n=37	Both n=22	Crop n=10	Livestock n=5
Maintain farm building	4.4	4.0	4.8	4.6
Install water line/fixtures	3.8	3.9	3.6	4.2
Maintain & repair grain forage handling equipment	3.4	3.8	2.8	3.2
Construct small farm building	3.3	3.5	3.0	3.0
Install plumbing fixtures	3.2	3.3	2.8	3.8
Select building materials	3.0	3.0	3.1	2.8
Construct concrete forms	2.6	2.6	2.6	2.8
Layout farmstead	2.5	2.1	2.9	3.0
Maintain well & pump	2.5	2.3	2.3	3.4
Construct major farm building	2.4	2.6	2.2	2.0
Install/maintain grain auger	2.1	2.3	1.5	2.0
Determine concrete	2.0	1.7	2.0	2.8
Mix concrete	1.8	1.8	2.5	0.4
Finish concrete	1.8	1.8	2.0	1.4
Erect bins & storage	1.7	2.0	1.4	0.8
Maintain septic tank system	1.7	1.8	1.2	2.0
Install/maintain grain dry equipment	1.5	1.8	0.6	0.0
Install/maintain LP-gas lines	1.3	1.3	1.2	1.2
Install/maintain building vent system	0.7	0.7	0.5	1.0
Use solar for heat	0.2	0.2	0.2	0.0
Maintain building air conditioning	0.1	0.1	0.2	0.0
Construct solar heat system	0.0	0.0	0.0	0.0

Soil and Water Management Activities

Information related to the importance of soil and water management activities is included in Table 4. Four soil and water management activities were identified as important by young farmers in the sample. These included determining field size and acreage, estimating and considering the slope of a field in planning its use, layout of terraces and waterways, and the construction of terraces and waterways. There were differences between the sample of those OYF in the crops only subgroup. Crop farmers rated three additional activities as important to their operations: using land leveling equipment, using the farm level, and planning and installing field drainage systems.

Table 4

Means of Soil and Water Management Activities performed by OYF by Enterprise

Mechanical Activities	All n=37	Both n=22	Crop n=10	Livestock n=5
Determine field size and acreage	4.9	4.7	5.3	4.6
Estimate slope and consider in plan	3.9	4.0	5.3	2.4
Layout terraces and waterways	3.8	3.2	5.0	4.2
Construct terraces and waterways	3.8	3.1	5.1	4.0
Plan/install drain	2.7	2.6	4.3	0.0
Use land level equipment	2.0	1.0	4.9	1.2
Use farm level	2.0	1.0	4.9	1.2
Locate farm pond	1.9	1.8	2.2	2.2
Construct farm pond	1.7	1.7	1.9	1.2
Irrigate crop-pasture	1.1	0.5	2.6	1.0
Maintain irrigation system	1.0	0.2	2.6	1.0
Install irrigation system	0.5	0.0	1.4	1.0

Electric Power and Processing Activities

Table 5 lists the mean values of all electrical power and processing activities included in the study. None of the 12 electric power and processing activities listed in this category were rated by the respondents as important to their farming operations. There were differences among the subgroups. Young farmers with only crop enterprises rated the use of the National Electric Code as an important activity. The five young farmers in the livestock subgroup identified planning electrical wiring needs, selecting electrical wiring supplies, and installing interior wiring as important activities.

Conclusions and Recommendations

Outstanding Young Farmers were concerned about mechanical practices on Mississippi farms and ranches. This concern was demonstrated by a 74% return on a mailed questionnaire and the assigned values to selected activities on the instrument. The sample of 37 Outstanding Young Farmers rated the 33 power and machinery activities highest among the five categories with a grand mean of 4.0 on a six-point scale. Twenty-seven

Table 5

Means of Electric Power and Processing Activities Performed by OYF by Enterprise

Mechanical Activities	All n=37	Both n=22	Crop n=10	Livestock n=5
Install main & breaker	2.4	2.0	2.9	3.7
Select electrical supplies	2.1	1.8	2.4	3.0
Install interior wire	2.0	2.0	1.6	3.0
Install ground equipment	2.0	1.7	2.7	2.0
Plan wiring needs	1.9	1.7	1.9	3.0
Install service wire	1.8	1.5	2.2	2.5
Select/install motor and controls	1.7	1.7	2.2	2.2
Use the NEC code	1.6	0.9	3.7	1.0
Service motors	1.5	1.4	1.6	2.0
Locate distribution center	1.4	1.1	1.9	2.0
Select heating/cooling equipment	1.0	0.4	1.9	2.0
Sketch circuits	0.7	0.4	1.2	0.8

activities (82%) had individual mean scores of 3.0 or higher by all respondents. Mississippi and Missouri Young Farmers (Long, 1981) were compared using a rank difference correlation (Tate, 1965). Activities in the power and machinery category were positively correlated ($r = .95$). There were no significant differences between the two groups as they perceived the importance of power and machinery activities.

Construction and maintenance activities received the second highest grand mean (3.4). Twenty-one of the 29 activities (72%) received a mean of 3.0 or higher by the sample. Mississippi and Missouri Young Farmers were in agreement as to the priorities of the list as demonstrated by a rank difference correlation of +.92.

The third highest grand mean among categories was soil and water management with a grand mean of 2.4 on the 12 activities. One-fourth of the items on the list received a value of 3.0 or higher by all respondents. The 10 young farmers with only crop enterprises rated three additional activities above the cutoff score. A comparison of Mississippi and Missouri Young Farmers resulted in a rank difference correlation of +.88.

Six of the 22 structures and environment activities were included above the cutoff score of 3.0 by young farmers. The grand mean of this category was 2.1. Mississippi Young Farmers rated these activities somewhat lower than their Mississippi counterparts; however, they agreed on the rank order of the list. The correlation was +.87 between the two groups.

Activities in electric power and processing were rated lowest of the five categories in this study. The grand mean of the 12 activities was 1.68 on a six-point scale. The sample did not identify any activity as important to their farming operation when the 3.0 cutoff level was used for decision-making. The young farmers from Mississippi and Missouri did agree on the rank order of the activities ($r = .83$).

Mechanization has had a significant impact in the agricultural industry. A futuring project commissioned by Production Credit Association of America (1983, p. 115) predicted "by the year 2000, the trend toward more farm mechanization will have increased in . . . tractors and engines, tillage and planting, crop harvesting and storage, remote sensing, and robots." The authors expected evolutionary development to continue. They reminded us that "new technologies will continue to be tested by a relatively small number of innovators before gaining widespread commercial acceptance." Mississippi teachers, teacher educators and curriculum planners may use this sample of 37 Outstanding Young Farmers as an advisory group to select mechanical activities to include in production agriculture programs. They identified 59 activities with a value of 3.0 or higher on a six-point scale. This list would serve as the benchmark on which local programs build curriculum. We should continue, even expand, our efforts to describe current practices among OYF. The replication of foundation descriptive research helps us renovate curriculum and will yield solid returns.

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