

# Harvesting Native Warm Season Grasses for Seed

Drew Kientzy

Agricultural Economist

MU Extension



**Extension**  
*University of Missouri*

# MU Budgets

## Native Warm-Season Grass Planning Budget

Using this budget, farmers can estimate the costs and returns of establishing native warm-season grass (NWSG) forage species. Table 1 presents estimates for replacing existing forage stands with NWSG in Missouri. Assumptions were based on price forecasts as of October 2021. The NWSG forage species mix used in this budget includes big bluestem, indiangrass, little bluestem and forbs. The mix was assumed to be planted in a dormant season. Multiple calendar years are needed for the NWSG stand to reach full forage yield potential. Seeding mixes are designed to enhance wildlife habitat and meet eligibility for cost share practices. Use the "Your estimate" column to plan your operation's costs and returns for 2022.

Table 1. Missouri big bluestem, Indiangrass, little bluestem and forbs budget for 2022.

	Year 1 Preparation	Year 2 Establishment	Year 3 Half production	Year 4 Full production	Your estimate
<b>Income</b>					
Haying	0.00	0.00	140.00	280.00	
Grading	0.00	0.00	18.00	36.00	
<b>Total income</b>	0.00	0.00	158.00	316.00	
<b>Operating costs</b>					
Warm-season grass seed	0.00	165.50	0.00	0.00	
Fertilizer/soil species seed mix	0.00	62.50	0.00	0.00	
Fertilizer and soil amendments <sup>1</sup>	81.90	0.00	39.53	79.06	
Competition management	28.80	26.00	0.00	0.00	
Chemical application	6.95	6.95	0.00	0.00	
Fertilizer application	6.18	0.00	6.18	6.18	
No-till drill use	0.00	20.00	0.00	0.00	
Hay baling and preparation	0.00	0.00	64.17	128.33	
Operator labor	0.00	8.75	0.00	0.00	
Operating interest	3.03	7.10	2.69	5.13	
<b>Total operating costs</b>	126.86	296.80	112.57	218.81	
<b>Ownership costs</b>					
Farm business overhead	0.00	0.00	0.00	0.00	
Machinery overhead/depreciation	0.00	0.00	0.00	0.00	
Real estate charge	8.50	34.00	34.00	34.00	
<b>Total ownership costs</b>	8.50	34.00	34.00	34.00	
<b>Total costs</b>	135.36	330.80	146.57	252.80	
<b>Income over operating costs</b>	-126.86	-260.80	45.43	97.19	
<b>Income over total costs</b>	-135.36	-294.80	11.43	63.19	

Note: Totals may not sum due to rounding.

1. University of Missouri Soil Test Lab recommends 7 pounds of P<sub>2</sub>O<sub>5</sub> and 14.6 pounds of K<sub>2</sub>O per ton of hay yield.

Written by  
Joe Horner, State Specialist, Agricultural Business and Policy Extension  
Ryan Millholin, State Specialist, Agricultural Business and Policy Extension  
Drew Kientzky, Student Assistant, Agricultural Business and Policy Extension

## Native Warm-Season Grass Seed Production

Harvesting native warm-season grass (NWSG) seed is a specialized operation. NWSGs produce small amounts of seed when compared to common cool-season grass species. Difficulties of seed production include inconsistent maturity, susceptibility to seed shattering, and limited weed control options. Recent droughts and high fertilizer prices have led many livestock producers and conservationists to consider replacing existing cool-season species with NWSGs. The difficulties faced producing NWSG seed and steady demand could create profitable opportunities for owners of established NWSG stands to harvest seed.

### Managing for seed

NWSGs are predisposed to stand longevity in a natural environment with no added fertility. When a stand is fertilized, forage yield increases but seed production remains the same. Native plants were not bred to increase seed yield from fertility boosts. In some scenarios, seed yield may decrease due to the plant's aggressive vegetative growth if fertilized. Seed harvest can begin one full growing season after the establishment year. However, it is recommended that NWSG stands are allowed to reseed themselves at least once every three years to maintain stand vigor.

### Harvest timing

Timing of harvest varies by species and weather conditions. Typically, most NWSGs will be ready for seed harvest in late summer or early fall. Since native grasses have not been improved to reduce seed shattering, catching the crop at the proper stage is essential for a good seed harvest. Each NWSG species displays slightly different indicators of maturity. A common test for NWSG seed maturity is to strike the seedhead against your

hand. If there is noticeable shattering, then the seed is ready for harvest.

### Harvest methods

There are a variety of methods used to harvest NWSG seed. Susceptibility to shattering makes conventional harvesting equipment less ideal for some NWSG species. Sensitive crops must be hand harvested in most scenarios. In this case, a laborer will walk through the field with a plastic hair comb and a bucket attached to their waist and comb seed into their bucket. A similar mechanized harvest method is a brush stripper. Brush strippers are usually mounted to a tractor with a front-end loader. Brush strippers work by rotating against the direction of travel to rake the loose seeds from the plant. The detached material from the stripper head falls in a holding bin at the rear of the unit. Stripper brushes produce a much cleaner sample than a combine since the entire stem of the plant is not cut. An example of a brush stripper can be seen in Figure 1. Handheld brush strippers are also available as attachments to common landscaping tools like power trimmers.



Figure 1. A loader-mounted brush stripper can be an effective way to harvest NWSG seed. Photo courtesy of Tannas Environmental Services.

Table 1 shows the harvesting and processing costs associated with using a loader-mounted brush stripper.

Seed less prone to shatter can be harvested by a combine. With a combine, growers must ensure that

Written by  
Drew Kientzky, Research Analyst, Agricultural Business and Policy Extension  
Joe Horner, State Specialist, Agricultural Business and Policy Extension



## NWSG Establishment & Forage



A landscape photograph showing a field of tall grasses in the foreground, transitioning to a lighter, hazy area in the middle ground, and a clear blue sky with scattered white clouds in the background. The image is split vertically, with the left side showing the field and the right side showing a white background with text.

# Benefits

- Animal performance
- Drought resistance
- Better haying season
- Ecological benefits
- Site specific adaptation

# Budgets Reflect 4 years

- Year 1 – Burn down/prep
- Year 2 - Plant
- Year 3 - Half production
- Year 4 – Full production







# Important Price Changes

- NWSG hay price down \$20
- Herbicide prices down 40-50%
- Interest rates down 1%
- Fertilizer down slightly now, next 6 months could be volatile
- Seed price steady to down slightly
- Labor and field activities mixed

# Big Bluestem & Indiangrass, without Forbs, Dormant Seeded

Category	Year 1 Seed Prep.	Year 2 Establish	Year 3 Half production	Year 4 Full production
<b>Income</b>				
Hay	0.00	0.00	183.75	367.50
Pasture	0.00	0.00	18.00	36.00
<b>Costs</b>				
Seed	0.00	150.00	0.00	0.00
Fertilizer, lime, soil test	84.80	0.00	31.27	62.55
Chemicals	10.24	3.28	0.00	0.00
Custom hire and rental	14.87	43.84	112.03	217.03
Other operating costs	4.40	16.89	5.73	11.18
Ownership costs	9.76	39.04	39.04	39.04
Total costs	124.07	253.05	188.07	329.80
<b>Income over total costs</b>				
	<b>(124.07)</b>	<b>(253.05)</b>	<b>13.68</b>	<b>73.70</b>

Notes: No cost share included, spring 2024 costs.

# Big Bluestem & Indiangrass without Forbs, Spring Planting Following Cover Crop

Category	Year 1 Seed Prep.	Year 2 Establish	Year 3 Half production	Year 4 Full production
<b>Income</b>				
<b>Income</b>				
Hay	0.00	0.00	183.75	367.50
Pasture	0.00	36.00	18.00	36.00
<b>Costs</b>				
Seed	60.00	150.00	0.00	0.00
Fertilizer, lime, soil test	71.90	30.30	31.27	62.55
Chemicals	10.24	13.52	0.00	0.00
Custom hire and rental	28.84	58.71	112.03	217.03
Other operating costs	15.84	19.10	5.73	11.18
Ownership costs	9.76	39.04	39.04	39.04
Total costs	196.58	310.67	188.07	329.80
<b>Income over total costs</b>				
	<b>(196.58)</b>	<b>(274.67)</b>	<b>13.68</b>	<b>73.70</b>

Notes: No cost share included, spring 2024 costs.



# Big Bluestem, Little Bluestem Indiangrass, + Forbs, Dormant Seeding

Category	Year 1 Seed Prep.	Year 2 Establish	Year 3 Half production	Year 4 Full production
<b>Income</b>				
Hay	0.00	0.00	183.75	367.50
Pasture	0.00	0.00	18.00	36.00
<b>Costs</b>				
Seed	0.00	200.00	0.00	0.00
Fertilizer, lime, soil test	84.80	0.00	31.27	62.55
Chemicals	10.24	3.28	0.00	0.00
Custom hire and rental	14.87	43.84	112.03	217.03
Other operating costs	4.40	18.89	5.73	11.18
Ownership costs	9.76	39.04	39.04	39.04
Total costs	124.07	305.05	188.07	329.80
<b>Income over total costs</b>				
	<b>(124.07)</b>	<b>(305.05)</b>	<b>13.68</b>	<b>73.70</b>

Notes: No cost share included, spring 2024 costs.

# Big Bluestem, Little Bluestem Indiangrass, + Forbs, Following Cover Crop

Category	Year 1 Seed Prep.	Year 2 Establish	Year 3 Half production	Year 4 Full production
<b>Income</b>				
Hay	0.00	0.00	183.75	367.50
Pasture	0.00	36.00	18.00	36.00
<b>Costs</b>				
Seed	60.00	200.00	0.00	0.00
Fertilizer, lime, soil test	71.90	30.30	31.27	62.55
Chemicals	10.24	13.52	0.00	0.00
Custom hire and rental	28.84	50.87	112.03	217.03
Other operating costs	6.84	20.79	5.73	20.18
Ownership costs	9.76	39.04	39.04	39.04
Total costs	187.58	354.52	188.07	338.80
<b>Income over total costs</b>				
	<b>(187.58)</b>	<b>(318.52)</b>	<b>13.68</b>	<b>64.70</b>

Notes: No cost share included, spring 2024 costs.

# Eastern Gamagrass, Dormant Seeding

Category	Year 1 Seed Prep.	Year 2 Establish	Year 3 Half production	Year 4 Full production
<b>Income</b>				
Hay	0.00	0.00	236.25	472.50
Pasture	0.00	36.00	36.00	36.00
<b>Costs</b>				
Seed	0.00	320.00	0.00	0.00
Fertilizer, lime, soil test	84.80	0.00	47.61	93.06
Chemicals	10.24	0.00	0.00	0.00
Custom hire and rental	14.87	36.00	142.03	277.03
Other operating costs	4.40	23.24	7.59	14.80
Ownership costs	9.76	39.04	39.04	39.04
Total costs	124.07	418.28	236.26	423.93
<b>Income over total costs</b>				
	<b>(124.07)</b>	<b>(382.28)</b>	<b>35.99</b>	<b>84.57</b>

Notes: No cost share included, spring 2024 costs.



# Establishment Cost Summary

Total Costs (Year 1 + Year 2)

Category	Big bluestem, indiagrass, no forbs, dormant Seeded	Big bluestem, indiagrass, no forbs, spring seeded	Big & little bluestem, indiagrass, forbs, dormant seeded	Big & little bluestem, indiagrass, forbs, spring seeded	Eastern gamagrass, dormant seeded
<b>Costs</b>	<b>\$/acre</b>	<b>\$/acre</b>	<b>\$/acre</b>	<b>\$/acre</b>	<b>\$/acre</b>
Seed	165.00	195.00	228.00	258.00	320.00
Fertilizer, lime, soil test	81.90	102.90	81.90	102.90	84.80
Chemicals	34.80	63.60	34.80	63.60	10.24
Custom hire and rental	40.08	67.03	40.08	60.08	50.87
Other operating costs	37.33	39.95	38.88	41.33	27.64
Ownership costs	42.50	42.50	42.50	42.50	48.80
<b>Total costs</b>	<b>\$401.61</b>	<b>\$510.99</b>	<b>\$466.16</b>	<b>\$568.41</b>	<b>\$542.35</b>
<b>Payback period (years)</b>	<b>4.93</b>	<b>6.21</b>	<b>5.64</b>	<b>7.61</b>	<b>5.56</b>
<b>Payback period with cost share (\$50/ac.)</b>	<b>4.25</b>	<b>5.53</b>	<b>4.96</b>	<b>6.84</b>	<b>4.97</b>

Notes: Spring 2024 costs.

# Observations on Costs

- Land out of production is a big hidden cost
- Do what is needed to get a good stand fast
- Seed is the major cost ~ 40-60%
- Know whether hay or grazing is primary objective when choosing seed mix
- Cost share can make huge difference in payback period



## NWSG Seed Harvest



Big Bluestem – 50 PLS lb



Seed harvest budget covers three solid-stand species  
- Key difference from guidance in NWSG Establishment resources

Seed harvest scenario presented as a partial budget  
- Use of low quality forage possible after seed harvest, value not comparable to normal seed harvest



Indiangrass – 57 PLS lb



Eastern Gamagrass – 42 PLS lb

# Management and Harvest Timing

Added N is not proven to boost seed yield

Harvest can begin after second growing season

- Peak yield will not be reached until year 3 and after

Seed maturity is dictated by shattering – hard dough stage

Harvest dates for NWSGs in Missouri are in early fall

- Harvest timing depends on goals
  - Maximizing seed yield
  - Maximizing seed collected at one time



# Harvest methods

## Brush stripper – 10-40% loss

- Generally, 8-12 feet wide, mounted to front end loader on farm tractor
- Works best on grasses with varying maturity and easy shattering
- Seed must be extremely light



## Combine – 10-20% loss

- Older models like those commonly seen in fescue harvest in southern Missouri
- Tight cylinder and low airflow
- Works best with grasses that mature more uniformly and with more dense seeds





# Seed Storage and Handling

- Flat storage less than 6" deep with gentle aeration (1 hp/ 1,000 sq. ft.)
- Stir weekly until seed is less than 12% moisture
- Stable storage conditions are difficult to attain in Missouri's climate
  - Sum of 100 Rule



# NWSG Seed Production Costs – Partial Budget

Notes: Brush stripper  
harvest, owned machinery,  
40 acres per year

Brush Stripper Harvesting Cost				
Operating costs	Unit	Quantity	Price	Total per acre
Stirring labor	Hours	1.00	17.92	\$ 17.92
Machinery operating cost				\$ 11.05
Drying	kWh	125	0.11	\$ 13.75
Storage upkeep	% of value	5.00%	500	\$ 25.00
Operating interest	% APR	7%	\$ 33.86	\$ 2.37
<b>Total operating costs</b>				<b>\$ 67.72</b>
Ownership costs				
Interest on facilities and equipment				\$ 30.07
Storage facility depreciation				\$ 16.00
Machinery depreciation				\$ 6.43
<b>Total ownership costs</b>				<b>\$ 46.07</b>
<b>Total costs per acre</b>				<b>\$ 113.79</b>

# NWSG Seed Production Costs – Partial Budget

Notes: Combine harvested,  
custom hired, 40 acres  
harvested per year

Combine Harvesting Cost					
Operating costs	Unit	Quantity	Price	Total per acre	
Stirring labor	Hours	1.00	17.92	\$	17.92
Custom combining				\$	35.00
Drying	kWh	125	0.11	\$	13.75
Storage upkeep	% of value	5.00%	500	\$	25.00
Operating interest	% APR	7%	\$ 45.84	\$	3.21
<b>Total operating costs</b>				\$	<b>94.88</b>
<i>Ownership costs</i>					
Interest on facilities and equipment				\$	17.50
Storage facility depreciation				\$	16.00
<b>Total ownership costs</b>				\$	<b>33.50</b>
<b>Total costs per acre</b>				\$	<b>128.38</b>



# NWSG Seed Production Economic Summary

<b>Big Bluestem Seed Production</b>		
	Brush-Stripper Harvested	Combine Harvested
Value of seed harvested	\$200.49	\$225.55
Cost of harvest, storage, and marketing	\$90.14	\$117.44
Fixed costs	\$46.07	\$33.50
<b>Return to land and management</b>	<b>\$64.28</b>	<b>\$74.62</b>

<b>Eastern Gamagrass Seed Production</b>		
	Brush-Stripper Harvested	Combine Harvested
Value of seed harvested	\$272.56	\$386.13
Cost of harvest, storage, and marketing	\$97.35	\$133.49
Fixed costs	\$46.07	\$33.50
<b>Return to land and management</b>	<b>\$129.15</b>	<b>\$219.14</b>

<b>Indiangrass Seed Production</b>		
	Brush-Stripper Harvested	Combine Harvested
Value of seed harvested	\$321.49	\$285.77
Cost of harvest, storage, and marketing	\$102.24	\$123.46
Fixed costs	\$46.07	\$33.50
<b>Return to land and management</b>	<b>\$173.18</b>	<b>\$128.81</b>

- Seed yield and prices can be highly volatile
- Timing is critical
- Have a marketing plan in place
- Cannot plan on using NWSG grown for seed as a quality forage source

## Key seed harvest considerations

<b>Eastern Gamagrass Seed Revenue</b>						
		<i>Seed Production (PLS lb/acre)</i>				
		29.1	35.4	41.6	47.8	54.1
<i>Seed price (\$/PLS lb)</i>	\$ 6.24	\$ 181.7	\$ 220.6	\$ 259.6	\$ 298.5	\$ 337.5
	\$ 8.58	\$ 249.8	\$ 303.4	\$ 356.9	\$ 410.5	\$ 464.0
	\$ 10.92	\$ 318.0	\$ 386.1	\$ 454.3	\$ 522.4	\$ 590.6
	\$ 13.26	\$ 386.1	\$ 468.9	\$ 551.6	\$ 634.4	\$ 717.1
	\$ 15.60	\$ 454.3	\$ 551.6	\$ 649.0	\$ 746.3	\$ 843.6

# Helpful links and resources

- **NWSG Planning Budget –**

- Guide - <https://extension.missouri.edu/publications/g672>
- Spreadsheet - <https://extension.missouri.edu/media/wysiwyg/Extensiondata/Pro/AgBusinessPolicyExtension/Docs/nwsg-seed-production-budgets.xlsx>

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- Guide - <https://extension.missouri.edu/publications/g673>
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