



Chapter 11

Economics of Midwest Strawberry Production and Marketing Systems

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The production and marketing of strawberries in the Midwest require a large investment per acre over the life of the crop. In the matted-row system, returns may not equal costs of field preparation and planting for one to two years after planting. New systems of culture may cost twice as much as the matted row. Larger investments per acre carry larger financial risks if cultural practices or weather causes a crop failure. On heavy soils, raised beds or tile drainage may improve yields. Each grower must decide on a system of culture that can produce high and early yields and must be able to carry a large initial investment.

Strawberry Systems Compared

An economic comparison of three strawberry production and marketing systems was made using early 2005 prices. For all systems, an estimated overhead cost per acre per year was calculated for all systems used on a 30-acre farm with five acres of non-productive land (Table 11-1). Estimated labor and equipment costs for all systems are shown in Tables 11-2 and 11-3. Selected material, chemical, and supply costs are shown on a per-acre basis (Table 11-4). In all systems, 60% of berries are sold as pick-your-own and 40% as hand-harvested berries.

The estimated costs and returns for the typical irrigated matted row are shown in Tables 11-5 to 11-9. Year zero constitutes the preparation year and year one is the planting year. This comparison has no fumigation, raised bed, or plastic. Yields begin in year two with 8,000, 6,000, and 5,000 pounds per acre in years two, three, and four. In year four, the planting is destroyed.

The costs and returns for an annual plasticulture system are shown in Table 11-10. This system uses plastic, raised beds, fumigation, and a double-row system. Row covers and overhead irrigation are used for frost control.

Table 11-1. Estimated Overhead Costs per Acre for Midwest Strawberry Production, 2005.

Item	Cost /Year/ Farm ¹ (\$)
Electricity	1,200
Signs, advertising, postage	850
Pickup	4,500
Telephone, communications	800
Buildings	3,000
Pond/pump/well	700
Road and gravel	450
Clothes, protective clothing	425
Tools ²	500
Taxes	1,000
Education	600
Professional fees ³	800
Insurance ⁴	1,200
Computer, printer, fax	525
TOTAL	\$16,600
COST / ACRE / YEAR⁵	\$664

¹ Farm is 30 acres with 5 acres nonproductive land; 25 acres produces fruit, vegetables, and other horticultural crops.

² For repairs, planting, welding, air compressor, etc.

³ Accounting fees.

⁴ Insurance is fire, disability, etc.

⁵ Tax base is 25 acres.

Table 11-2. Estimated Labor Costs for Midwest Strawberry Production, 2005.

Type of Labor	Hourly Rate	Social Security	Others ¹	Total Hourly Cost (\$)
Minimum wage	5.15	0.39	0.39	5.93
Unskilled labor	8.25	0.63	0.63	9.51
Semi-skilled labor	9.50	0.73	0.73	10.96
Skilled Labor	14.00	1.07	3.39	18.46

¹ Unemployment insurance, workers comp. (health insurance: skilled labor only @ \$200/month).

A modified strawberry plasticulture production system, which uses raised beds, plastic, one row, and straw mulch, is described in Tables 11-11 to 11-14. In year zero the field is prepared and in year two a single row of plants is set with drip irrigation and plastic. Estimated yields of 8,000 and 6,000 pounds per acre are harvested in year two and three, respectively.

Economic Summary of Strawberry Production Systems

Estimated costs and returns for three strawberry production/marketing systems were calculated based on 2005 costs and prices. In all systems, returns were based on 60% of the estimated yield for pick-your-own and 40% for hand-harvested berries. These systems have different estimated costs and returns over several years.

An internal rate of return analysis was used to determine the relative profitability of the three systems. A fair rate of return on investment is defined to be above the current rate for borrowed money. This rate or higher rate of return should be in relation to the financial risk because larger investments carry a higher risk than smaller investments.

Three strawberry production systems are compared as to their potential economic returns in Table 11-15. The matted row and annual plasticulture systems have four years of cost and return streams, and the modified plasticulture system has three years. Based on the estimated cost and return, the matted-row, annual plasticulture, and modified plasticulture had a rate of return of 24, -2.5, and 15 percent, respectively. If the grower increased the return by \$0.10 per pound of fruit, then the rate of returns would be 37, 4.5, and 25 percent, respectively.

Generally, any return under 10% does not present a reasonable level of financial risk. Secondly, a net profit below \$1,000 per acre for each year over the life of the planting is considered to be low. In general, the plan or goal is to produce a high and early yield and establish a price to have a positive return.

If your costs are similar to those in this study and if interest rates for a certificate of deposit are below 10 percent, then the prices that were used for 2005 are reasonable for a fair return. However, as costs increase, either yield, prices, or yields and price must increase over the life of the planting.

Table 11-3. Estimated Equipment Cost for Midwest Strawberry Production, 2005.¹

Equipment ¹	Initial Cost (\$)	Hours/Year	Years Dep.	Cost/Hour (\$)
Tractor				
30 - 4D	18,000	200	15	14.01
60 - 2D	36,000	300	15	20.74
90 - 2D	54,000	250	15	34.60
Plow — 3-16"	1,800	10	20	16.21
Rototiller — 60"	1,950	20	10	17.22
Sprayer — 110 gal.	8,300	50	15	22.67
Weed Sprayer — 50 gal.	2,100	20	15	12.08
Transplanter — 1 row	1,320	20	20	8.18
Bedder, plastic irrigation tube	4,400	10	15	48.45
Water wheel planter — 2 row	2,800	20	15	18.32
Wagon	1,100	50	20	2.97
Seeder — 6 ft.	3,500	10	20	37.10
Fertilizer spreader	1,250	10	15	14.53
Mower — 6 ft.	2,000	25	15	10.98
Straw spreader	4,680	20	15	34.86
Irrigation — Overhead	18,720	100	15	25.57
Irrigation — Drip	3,625	100	10	6.40

¹ Equipment costs such as transplanters and bedders include shipping charge.

Table 11-4. Estimated Cost of Materials, Chemicals, and Supplies for Midwest Strawberry Production, 2005.

Item — Description		Unit Cost	Cost/ Acre (\$)/ Application
Fumigation — custom			2,000.00
Fertilizer / 50 lbs	34-0-0	\$7.00	14.00
	19-19-19	\$7.70	15.40
	45-0-0	\$8.40	8.40
	0-0-60	\$8.50	34.00
Foliar / 20 lbs	20-20-20	\$40	4.00
Lime — spread		\$45/ton	90.00
Lime — pelletized		\$90/ton	90.00
Black Plastic — 1.25 ml embossed 4' x 4,000		\$115/roll + \$18 shipping	300.00
Row cover, medium — 26' x 800'		\$670/roll + \$100 shipping	1,700.00
Row cover, heavy — 25' x 500'		\$700/roll + \$100 shipping	3,000.00
Drip tube, 4 ml (15,000 ft 12")		\$175/roll + \$25 shipping	120.00
Drip tube, 15 ml (9,000 ft 12")		\$120/roll + \$25 shipping	150.00
Straw — 40 lbs/bale		\$2.50 x 100 bales, delivered	250.00
Rye — 1 bushel			10.00
Lay flat — 2" x 300 ft			101.00
Values, brass gate — 1-1/2"			12.30
Injector — 1-1/2 - 70 gph			84.50
Sinbar		\$37/lb	18.60
Spartan		\$115/gal	7.20
Stinger		\$283/0.5 gal	35.40
Devrinol		\$85/8 lb	64.00
Dacthal		\$206/12 lb	206.00
Roundup		\$180/2.5 gal	36.00
Captec		\$68/2.5 gal	13.60
Topsin		\$91/5 lb	18.20
Elevate		\$75/2 lb	56.50
Nova		\$88/20 oz	17.60
Quadris		\$327/gal	20.50
Ridomil		\$111/ pt	111.00
Cabrio		\$137/5 lb	23.75
Switch		\$127/28 oz	54.60

Table 11-4 (continued). Estimated Cost of Materials, Chemicals, and Supplies for Midwest Strawberry Production, 2005.

Item — Description	Unit Cost	Cost/ Acre (\$)/ Application
Endosulfan	\$39/5 lb	19.50
Sevin	\$87/2.5 gal	17.40
Guthion	\$566/5 lb	11.20
Brigade	\$103/2.5 lb	41.00
Admire	\$88/1 pt	88.00
Savey	\$208/12 oz	520.00
Deadline Bait	\$97.50/50	48.75
Poast	\$200/2.5 gal	25.00
Select	\$211/gal	27.00
2,4-D	\$45.50/2.5 gal	11.00
Crop oil	\$13.50/2.5 gal	1.35
Nufilm/spreader	\$33.50/gal	1.70
Plants - all systems	\$140/m	1,540.00

* Prices are estimated and do not include shipping, delivery charge, nor discount for large quantities unless indicated.

Table 11-5. Estimated Costs per Acre for Matted-Row System in the Midwest in Preplant Year (0), 2005.

Operation ¹	Year 0	Cost (\$)/Acre ²
Soil sample (0.33 hr x 18.46 + 18.00)		24.09
Apply herbicide (0.5 hr) x (18.46 + 14.01 + 12.08) + 36.00		58.28
Plow (1.0 hr) x (18.46 x 20.74 x 16.21)		55.41
Apply lime, nutrients (0.5 hr) x (14.01 + 14.53 + 18.46) + 90.00 + 30.80		144.30
Rototill (1.5 hr) x (18.46 + 17.22 + 14.01)		74.54
Seed cover crop (0.5 hr) x (18.46 + 14.01 + 37.10) + 20.00		54.78
Overhead		664.00
Land charge (irrigated land)		250.00
Management — 10% (4.3)		7.94
Sub Total		1,333.34
Interest		93.33
TOTAL		\$1,426.67

¹ Operation includes labor, equipment, materials, etc. See Overhead Costs, Table 11-1.

² No fumigation; dormant plants; single row; 12-inch spacing; 4-ft. row spacing; irrigated.

Table 11-6. Estimated Costs per Acre for Matted-Row System in the Midwest in Planting Year One (1), 2005.

Operation ¹	Year 1	Cost/Acre (\$)
Herbicide, cover crop — (0.5 hr.)		58.28
Rototill (1.5 hr.)		74.54
Plants — 11,000 @ \$140/m		1,540.00
Planting/Replanting — 10 hr.		298.35
Irrigation — 4 hr., Install		43.84
15 hr. — Operation		260.40
Drip material — 1.0 hr.		150.00
Fertilizer, twice (18.96 + 14.01 + (4.53) + 28.00)		75.00
Weed Control		
Hand — 12 hr.		114.12
Chemical — 3 applications		381.21
Insect/Disease — 1.0 hr.		159.70
Straw — Material		250.00
— 12-hr. Application		469.74
Overhead		664.00
Land Charge		250.00
Management — 10% (59)		111.86
SUB TOTAL COST		4,901.04
Interest 7%		343.07
TOTAL COST		\$5,2445.11

¹ Rows are four feet wide and plants are set at 12 inches with drip irrigation expected to operate for five years.

Table 11-7. Estimated Costs and Returns per Acre for Matted-Row Strawberry Production in Year Two (2) in the Midwest, 2005.

Item — Description ¹		Year 2	Cost (\$)/Acre
Remove straw — 6 hr.			65.76
Herbicide	0.5 Spring		86.28
	1.0 Renovation		66.65
	0.5 Summer		228.28
	0.5 Fall		52.25
Weed control — hand + rototill (74.54) — 16 hr.			228.24
Frost control — 20 hr. (9.51 + 25.57)			700.60
Drip irrigation — 4 hr.			43.84
Insecticide ² / Fungicide — 2.0 hr. (22.67 + 20.74)			379.12
Harvest Labor	PYO — 12 hr.		131.52
	Hand — 160 hr.		1,521.60
Transport fruit — 4 hr.			43.84
Refrigerate — 1/2 volume — 2.0 hr.			53.12
Containers	PYO — 480 x 0.68		326.40
	Hand — 320 x 0.82		262.40
Fertilizer — 1.0 hr. twice			75.50
Straw mulch — 12 hr. (plus material + equipment)			719.74
Overhead			664.00
Land charge			250.00
Management — 10% (24.6)			467.36
COST	Sub Total		6,366.50
	Interest 7%		445.66
TOTAL COST			\$6,812.16
RETURNS			
	PYO — 4,800 @ 1.10		5,280.00
	Hand — 3,200 @ 2.00		6,400.00
TOTAL RETURN			\$11,680.00
NET RETURN			4,867.84
NET RETURN / lb			0.61

¹ Year 2 is the first harvest year with 8,000 pounds harvested; 60% PYO, 40% Hand.

² Insecticides (2) are combined with fungicide sprays.

Table 11-8. Estimated Costs and Returns per Acre for Matted-Row Strawberry Production in Year Three (3) in the Midwest, 2005.

Item — Description ¹		Year 3	Cost (\$)/Acre
Remove straw — 6 hr.			65.76
Herbicide — 4 applications			499.22
Weed control — hand + rototill			228.28
Frost control			700.60
Drip irrigation			139.84
Insecticide/Fungicide			379.12
Harvest Labor — PYO 12 hr.			131.52
Hand labor — 120 hr.			1,141.20
Transport fruit — 3 hr.			32.88
Refrigerate — 2.0 hr.			45.92
Containers	PYO — 360 @ 0.68		244.80
	Hand — 240 @ 0.82		196.80
Fertilizer			75.50
Straw mulch			719.74
Overhead			664.00
Land charge			250.00
Management 10% (20)			371.20
COST	Sub Total		5,886.38
	Interest 7%		412.05
TOTAL COST			\$6,298.43
Return	3,600 lb @ 1.10		3,960.00
	2,400 lb @ 2.00		4,800.00
TOTAL RETURN			\$8,760.00
NET RETURN			2,461.57
NET RETURN / lb			0.41

¹ Year three has similar items and operations as Year 2 (Table 11-7) with 6,000 pounds of berries harvested; 60% PYO, and 40% Hand.

Table 11-9. Estimated Costs and Returns per Acre for Matted-row Strawberry Production in Year Four (4) in the Midwest, 2005.

Item — Description ¹		Year 4	Cost (\$)/Acre
Remove straw — 6 hr.			65.76
Herbicide — 1 application			86.28
Weed control — 1 application 8 hr. (no rototill)			76.08
Frost control			700.40
Drip irrigation			139.84
Insecticide/Fungicide			379.12
Harvest labor — PYO (12 hr)			131.52
Hand labor — 100 hr)			951.00
Transport fruit — 2 hr.			21.12
Refrigerate	2 hr. (\$21.12 + 20.00)		41.12
Containers	PYO — 300 @ 0.64		204.00
	Hand — 200 @ 0.82		164.00
Fertilizer — none			—
Straw mulch — none			—
Overhead			664.00
Land charge			250.00
Management 10% (15)			284.40
COST	Sub Total		4,158.64
	Interest 7%		291.10
TOTAL COST			\$4,449.74
Return	3,000 @ 1.10		3,300.00
	2,000 @ 2.00		4,000.00
TOTAL RETURN			\$7,300.00
NET RETURN/acre			2,850.26
NET RETURN / lb			0.57

¹ In year four, 5,000 pounds are harvested, and the planting is terminated after harvest; 60% are PYO and 40% Hand.

Table 11-10. Estimated Costs and Returns per Acre for Strawberry Plasticulture Production for One Year in the Midwest, 2005.

Item — Description ¹	Year 1	Cost (\$)/Acre
Land preparation		
Soil sample		24.09
Herbicide old crop — 0.5		58.28
Remove old plastic and dispose — 16 hr.		152.16
Disking and lime fertilizer 2.5 hr.		139.01
Cover crop — 1.0 hr.		54.78
Preplant		
Rototill — 1.5 hr.		74.54
Fertilizer		75.50
Fumigate ²		2,000.00
Plastic		300.00
Drip tube (4 mil)		120.00
Raised bed 1.5 hr. (18.46 + 34.60 + 48.45 + 10.96)		168.70
Plant		
Herbicide		86.28
Plants — 17,600 @ 140/m		2,464.00
Transplant-double row — 6 hr (18.46 + 10.96(2) + 20.74 + 18.32) 21.92		476.64
Deer control — 3 hr. labor + materials		192.88
Preharvest		379.12
Insecticide/fungicide		
Floating row cover — 5 hr. (2)		109.60
— material ³		850.00
Frost control — replace row cover		109.60
Drip irrigation — 6 hr + 3 injections		77.76
Tissue samples		24.00
Overhead irrigation — frost control		700.40
Harvest		
Labor — 280 hr		2,662.80
Containers — PYO - 425 @ 0.68		289.00
Hand - 280 @ 0.82		229.60
Harvest supervision — 33.5 hr.		353.76
Transport — 7 hr.		73.92
Refrigerate — 7 hr.		137.92

Table 11-10 (continued). Estimated Costs and Returns per Acre for Strawberry Plasticulture Production for One Year in the Midwest, 2005.

Item — Description ¹	Year 1	Cost (\$)/Acre
Overhead		664.00
Land charge		250.00
Management 10% (41.5)		756.86
COST		\$14,055.20
Sub Total		
Interest 7%		983.86
TOTAL COST		\$15,039.06
RETURN ⁴		
PYO — 8,500 @ 1.10		9,350.00
Hand — 5,600 @ 2.00		11,200.00
TOTAL RETURN		\$20,550.00
NET RETURN/acre		5,510.94
NET RETURN / lb		0.39

¹ An annual system at 5 ft between rows; plastic; raised bed with drip irrigation; fumigation.

² Custom operator applied.

³ Row cover usable for 2 seasons.

⁴ Yield estimated at 14,000 lb/acre or approximately 0.8 times 17,600 plants.

Table 11-11. Estimated Costs per Acre for Modified Strawberry Plasticulture Production System in the Midwest, 2005.

Item — Description ¹	Year 0	Cost (\$)/Acre
Soil sample — 0.33		24.09
Apply Herbicide — 0.5		58.28
Plow — 1.0 hr.		55.41
Apply lime, nutrients — 2.5 hr.		144.30
Rototill — 1.5 hr.		74.54
Raised bed — 1.5 hr.		168.70
Plastic — 1.5 hr. (300.00 material)		468.70
Drip tube (15 mil) — 12 inch		150.00
Herbicide — 0.5		6.28
Seed cover crop — 0.5		54.78
Deer control — 3 hr.		182.88
Overhead		664.00
Land charge		250.00
Management — 10% (1.0)		18.46
SUB TOTAL COST		\$2,392.42
Interest 7%		167.47
TOTAL COST		\$2,559.89

¹ Raised bed at 48 inches between rows; plastic; drip irrigation; no row cover or fumigation; expected two harvests or three-year rotation with eastern strawberry red stele-resistant plants.

Table 11-12. Estimated Costs per Acre for Modified Strawberry Plasticulture Production System in the Midwest, 2005.

Item — Description ¹	Year 1	Cost (\$)/Acre
Plants — 11,00 @ 140/m		1,540.00
Planting/replanting — 10 hr.		298.35
Irrigation operation — 15 hr.		164.40
Fertilizer — foliar, drip		28.00
Weed control — hand, 12 hr.		114.12
Insect/disease — 1.0 hr.		159.70
Straw		
— material		250.00
— application, 12 hr.		469.76
Deer control		192.88
Overhead		674.00
Land charge		250.00
Management — 10% (5)		92.30
SUB TOTAL		\$4,233.49
Interest		296.34
TOTAL COST		\$4,529.83

¹ Dormant plants spaced 12 inches between plants and 48 inches between rows; planted in April with sod between rows; raised bed; plastic and drip irrigation installed in fall before spring planting.

Table 11-13. Estimated Costs per Acre for Modified Strawberry Plasticulture System in the Midwest, 2005.

Item — Description ¹	Year 2	Cost (\$)/Acre
Remove straw — 6 hr.		65.76
Weed control — hand, 8 hr. @ 10.96		87.68
Runner control — 8 hr. @ 10.96		87.68
Frost control — 20 hr.		700.60
Drip irrigation — 4 hr. labor + 15 hr.		139.84
Deer control — 3 hr.		192.88
Insecticide/fungicide — 2.0 hr.		379.12
Harvest labor		
PYO — 12 hr.		131.52
Hand — 160		1,521.60
Transport — 4 hr.		43.84
Refrigerate — 1,600 lb — 2 hr.		53.12
Containers		
PYO — 480 x 0.68		326.40
Hand — 320 x 0.82		262.40
Fertilizer — 1.0 hr. twice		75.50
Straw mulch — 10 hr.		719.74
Overhead		664.00
Land charge		250.00
Management (24)		440.64
COST		
Sub Total		6,142.32
Interest 7%		429.96
TOTAL COST		\$6,572.28
RETURN		
PYO — 4,800 @ 1.10		5,280.00
Hand — 3,200 lb @ 2.00		6,400.00
TOTAL RETURN		\$11,689.00
NET RETURN		5,107.72
NET RETURN/LB		0.64

¹ This system utilizes overhead sprinklers for frost control. Plastic is expected to last three seasons. Hand weeding only.

Table 11-14. Estimated Costs per Acre for Modified Strawberry Plasticulture System in the Midwest, 2005.

Item — Description ¹	Year 3	Cost (\$)/Acre
Remove straw — 6 hr.		65.76
Weed control — 4 hr. hand		43.84
Insect/disease — 2.0 hr.		379.12
Frost control — 20 hr.		700.40
Drip irrigation — 6 hr. + injection		77.76
Deer control — 3 hr.		192.88
Containers		
PYO — 360		244.80
Hand — 240		196.80
Harvest		
Labor PYO (12 hr.)		131.52
Labor Hand (120 hr.)		1,141.20
Transport — 3 hr.		32.88
Refrigerate — 2.0		45.92
Remove plastic, dispose		152.16
Overhead		664.00
Land charge		250.00
Management — 10% (18)		332.28
COST		
Sub Total		4,651.32
Interest 7%		325.59
TOTAL COST		\$4,976.91
RETURN		
PYO — 3,600 lb @ 1.10		3,960.00
Hand — 2,400 lb @ 2.00		4,800.00
TOTAL RETURN		\$8,760.00
NET RETURN		3,783.09
NET RETURN/LB		0.63

¹ Sprinkler irrigation used for frost control. Plastic is removed because this is the last harvest — second harvest. Spring weed control only.

Table 11-15. Estimated Internal Rate of Different Strawberry Systems in the Midwest, 2005.

System ¹	Year	Cost(\$)/ Acre	Return/acre ² (\$)		IRR ³ — %	
			60%	40%		
Matted Row						
	0	1,427	0	0		
	1	5,244	0	0		
	2	6,812	11,680	12,480		
	3	6,298	8,760	9,360		
	4	4,159	7,000	7,800		
	Total	23,940	27,440	29,640	24%	37%
	Difference	—	3,500	5,700		
Annual Plasticulture						
	1	15,039	20,550	21,960		
	2	11,678	0	0		
	3	14,020	17,520	18,720		
	4	12,980	14,600	15,600		
	Total	53,717	52,670	56,280		
	Difference	—	-1,047	+2,563	-2.5	+4.5
Modified Plasticulture						
	0	2,560	0	0		
	1	4,530	0	0		
	2	6,366	11,680	12,480		
	3	4,977	8,760	9,360		
	Total	18,433	20,440	21,840	15	25
	Difference	—	2,007	3,407		

¹ Please refer to Tables 11-5 to 11-14 for cost/returns and description of systems. Costs are rounded to nearest dollar.

² Returns are 60% pick-your-own at \$1.10 or \$1.20 and 40% hand harvested at \$2.00 or \$2.10 per pound.

³ IRR — Internal rate of return analysis indicates the percent return on total investment over the entire time of planting.

Table 11-16. Estimated Total Cost per Hour for Specific Equipment and Labor for a Small Midwest Strawberry Farm, 2005.

Item	Hours/Yr.	Cost/Hr. (\$)	Labor ¹ (\$)	Total Cost/Hr. (\$)
Tractors²				
30/4D	200	14.01	9.23	23.34
60/2D	200	20.74	9.23	29.97
90/2D	250	34.60	9.23	43.83
Sprayers				
Weed	20	12.08	9.23	21.31
Air Blast	50	22.67	9.23	31.90
Bed Shaper, etc.	10	48.45	9.23	57.68
Transplanter	20	8.18	28.25	36.43
Rototiller	20	17.22	9.23	26.45
Water Wheel Planter	20	18.32	28.25	46.57
Fertilizer Spreader	10	14.53	9.23	23.76
Mower	25	10.98	9.23	20.21
Straw Spreader	25	34.86	28.25	63.11
Irrigation				
Overhead	100	25.57	10.96	36.53
Drip	100	6.40	10.96	17.36
Wagon	50	2.97	9.23	12.20
Pick-up	150	30.00	18.46	48.46
¹ Labor is one skilled person for most operations, except two unskilled people for water wheel planter, transplanter, straw spreader. Labor is 50% tractor and 50% attached equipment. ² See Table 11-3 for additional information.				