2-3. Coverage (Covered area)

2-3-1. Coverage

Coverage (Covered area) will be used for certain farm work ability of certain period by actual sets, which is a seasonal period of for a crop. Coverage is simply obtained by following process.

CA = DC * AWD **Eq. 2-3-1**

CAS = DC * AWD / M **Eq. 2-3-2**

where,

symbol	term	unit
CA	Coverage (Covered area)	ha
CAS	Coverage of one set	ha
CA_W	Coverage of a work	ha
DC	Daily capacity	ha/d
AWD	Available work days	d
M *	Number of machine set	-
N *	Number of operation times	-

* : normally N = 1

Table 2-3-1 Example of Covered Area

Farm work	Name		Tillage	Rice transplanting	Weeding
Type of work	TOW		M	M	L
5-1.Effective Field Capacity					
Main machine	Name		Walking Tractor	Rice transplanter	Weeder
No. of machine set	M	-	1	1	2
No. of workers	Nw	-	1	2	2
Effective Field Capacity	EFC	ha/h	0.082	0.117	0.038
5-2. Daily Capacity and Coverage					
Work hour per day	Dt	h/d	8.0	8.5	8.5
Net Work rate	NWR	%	80	70	80
Net Work hours	Dn	h/d	6.4	6.0	6.8
Daily Capacity	DC	ha/d	0.522	0.696	0.523
Working period:First day	DATES	day-month	31-May	20-Jun	2-Jul
:Last day	DATEE		18-Jun	28-Jun	29-Jul
Days	DWP	d	19	9	28
Rate of available day	RAD	%	62	72	71
Available work days	AWD	d	11.8	6.5	19.9
Covered area	CA	ha	6.2	4.5	10.4
Coverage of one set	CAS	ha	6.2	4.5	5.2
Covered area	CA_W	ha	6.2	4.5	10.4

Example: Refer to. appendix\fm-33CA.xls

Exercise. 2-17, 2-18

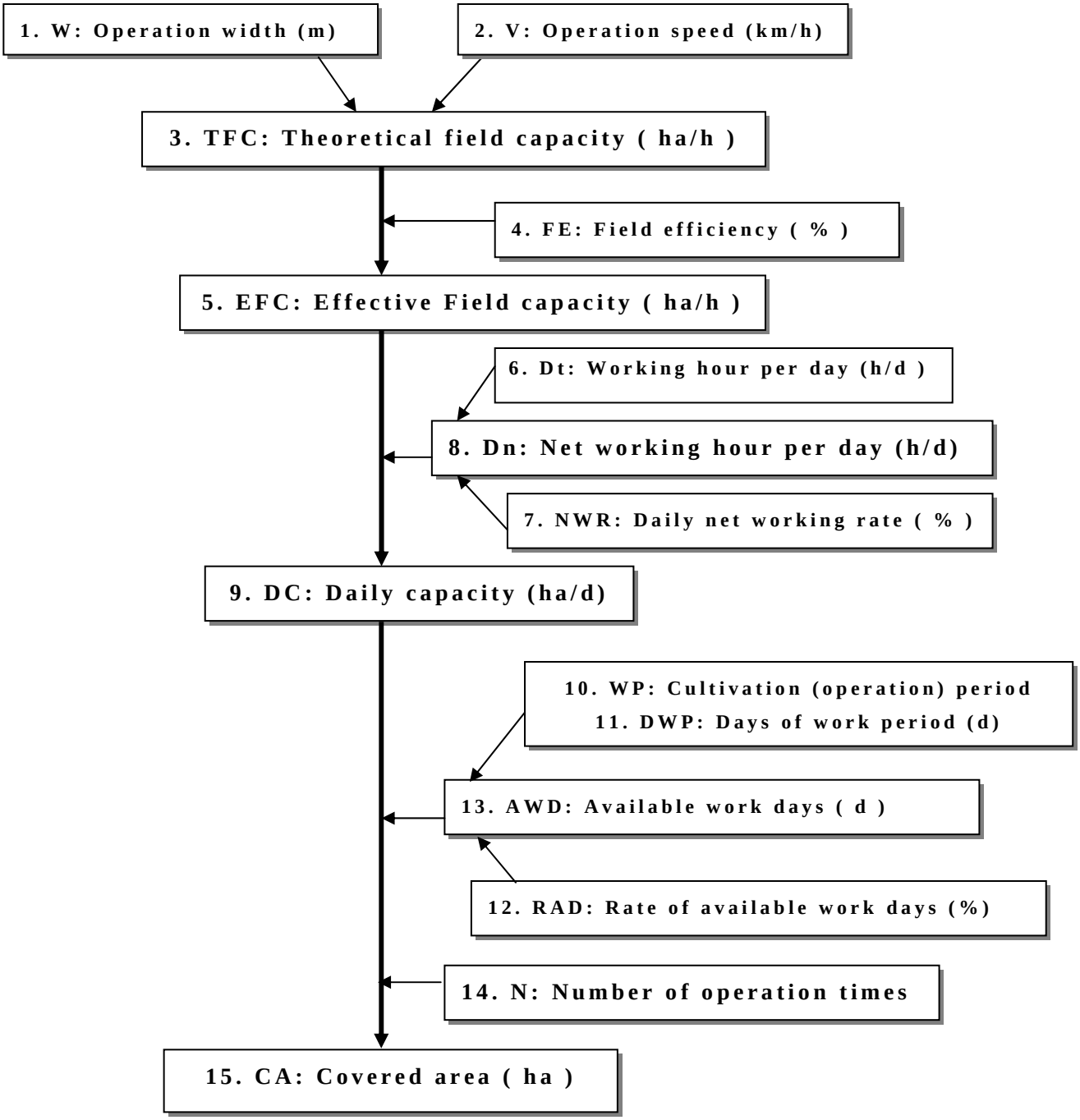

Fig. 2-3-1 Flow chart to obtain coverage

2-3-2. Available Work Days

Available work days means actual days available to work.

Freezing temperatures, precipitation, excessive deficient soil moistures, and other weather related factors may limit field machines operations. As weather variability is great, any prediction of the number of future working days can only be made probabilistically.

The number of working days in any time period is a function of: climatic region, slope of soil surface, soil type, drainage characteristics, operation to be performed, and traction devices.

AWD = DWP * RAD **Eq. 2-3-3**

Where,

symbol	term	unit
AWD	Available work days	d
DWP	Days of work period	d
RAD	Rate of available work days	%

Table 2-3-2 Example of Available work days

Work Name	Implement	Effective Field Capacity	Net Work hours	Daily Capacity	Working period	Days of work period	Rate of available work day	Available work days
		EFC	Dn	DC	WP	DWP	RAD	AWD
		ha/h	h/d	ha/d	date to date	d	%	d
Tillage	Bottom plow 14"x2	0.224	7.2	1.61	Apr.1-May 20	50	74	37.0
Tillage	Rotary 1.8m	0.266	7.2	1.92	Apr.1-May 20	50	74	37.0
Harrowing	Paddy harrow 20	1.132	7.4	8.32	May.1-May 20	20	73	14.6
Trans-planting	Rice trans-planter 2-row	0.036	7.0	0.26	May.1-May 20	20	73	14.6

Refer to fm-311.xls

Exercise. 2-19

2-3-3. Available net working hour

ANWH = AWD * Dn **Eq. 2-3-4**

Where,

symbol	term	unit
ANWH	Available net working hour	h
AWD	Available work days	d
Dn	Net working hours	h/d

2-3-4. Rate of Available Work Days

In the work period, machines are not available for use due to the precipitation and periodical machine maintenance etc. Therefore, these unavailable days are deducted from total work days of the period.
The weather condition and its suitability to out side work can be get in the weather chart for agriculture which was gathered by meteorological agency.

Table 2-3-3 shows the rate of monthly available work day based on the data of “available work days at outside”.

Table 2-3-3 The Rate of Monthly Available Days for Machinery Work with Judging from Weather (%)

Place / Area \ Month		January	February	March	April	May	June	July	August	September	October	November	December
Hokkaido	Sapporo	0	0	0	73	73	70	71	69	75	61	57	0
Kanto	Kumagaya	90	88	84	75	73	62	71	82	67	74	87	94
Okinawa	Naha	77	75	77	68	60	52	74	65	73	74	82	77

rainfall less than 10mm/d

Refer to fm-33a.xls (for upland work see ASAE-D497: ASAD4971.xls)

Exercise. 2-20

2-4. Exercise

Exercise 2-1.
When field area=2 ha, total time required a farm work=5 h, obtain Effective Field Capacity and Work Capacity.

Exercise 2-2.
When field area=20a, total time required a farm work=50min, obtain Effective Field Capacity and Work Capacity.

Exercise 2-3.
When field area=1.2 ha, actual operating time required a farm work=1.5 h, Obtain Effective Field Capacity and Work Capacity.

Exercise 2-4.
When rice grain 800kg was produced in 30min by thresher. Yield of rice was 4t/ha. Obtain Effective Field Capacity of this thresher.

Exercise 2-5.
In plowing of the field (40*30 m), data of times required was as follows.

		min: second
ta	Actual operating time	13: 36
tb	Turning time	8: 46
tc	Moving time	0: 30
td	Regulating time	1: 06
	Other time	0

Obtain Total operating time, and Effective field capacity.

Exercise 2-6.
When Wt and Vt were as follows, obtain theoretical field capacity.

Wt	Theoretical operation width	0.6 m
Vt	Theoretical operation speed	3 km/h

Exercise 2-7.
Pick up a farm work in your country (Example: tillage, weeding). Select a machine and list up width and speed.
Obtain Theoretical Field capacity (TFC) and Effective Field capacity (EFC).

Exercise 2-8.
Obtain Field Efficiency in percentage, when EFC=1.3, TFC=1.7 (ha/h).

Exercise 2-9.
Obtain Field Efficiency in percentage, in exercise 2-5.

Exercise 2-10.
Obtain Total time of labor and Effective Field capacity of a set of threshing, when A = 0.2 ha, time required of machine=0.7 h, number of workers=3.

Exercise 2-11.
Obtain Effective Field capacity of manual weeding, when A = 0.2 ha, time required =0.6 h, number of workers=5.

Exercise 2-12.
Obtain Effective Field capacity and Work capacity in case of tillage by power tiller, when W=0.6m, V=1.8km/h, FE=70%.

Exercise 2-13.
Obtain Coverage of tillage(by machine) and weeding(by hand) in your country farm, after listing farm work data of your conventional farm work.

Exercise 2-14.
Obtain Daily Capacity and Net Work hours per day, when Dt=8h, NWR =70% and EFC=0.2 ha/h.

Exercise 2-15.
Show working hours per day in your countries.

month North latitude (Name of place)	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Your country												
35.30 (Tokyo, Ibaraki)	7.1	7.9	9.0	10.1	11.0	11.5	11.3	10.6	9.4	8.4	7.5	6.9

Exercise 2-16.
Obtain Daily Net Work Rate (NWR) using following data.

Items	Needed Time		Items of required hours								
	Starting time	Ending time	Working hours		Other extra hours						
			Plow	Disk harrow	Dp	Db	Ds	Dc+Df	Da	Dm	Dr
	h. min	h. min	min	min	min	min	min	min	min	min	min
Garage-Field 1	7.00	7.20					3	10	7		
Field 1 (0.5ha)	7.20	9.55	151		4						
Field 2 (0.16ha)	9.55	11.19	66		5	10			3		
Field 2-Garage	11.19	11.45			4	9		7	6		
Lunch Time	11.45	13.30								105	
Garage-Field 3	13.30	13.40			1				6		3
Field 3 (0.6ha)	13.40	17.00	198		2						
Field 3-Garage	17.00	17.15					10		4		1
Garage-Field 1	17.15	17.20							4		1
Field 1: Disk harrow	17.20	18.40		77							3
Field 1-Garage	18.40	18.55					2	8	5		

Exercise 2-17.
When Daily capacity =0.48 ha/d, Available work days =21 d, obtain Coverage of one set.

Exercise 2-18.
When Effective field capacity =0.009 ha/h, Number of workers = 5, Available work days =21.9 d, Net work hour=6.4h/d , obtain Coverage of this manual weeding.

Exercise 2-19.
When Days of farm work period =(April 10 to 24), Rate of available work days = 75%, obtain Available work days.

Exercise 2-20.
Pick up a farm work in your country (Example: tillage). Select a machine and list up width and speed.
{1. (TFC) and (EFC) by Ex.2-7.}
2. Obtain Daily capacity (DC) by using working hour per day (Dt) and Daily net working rate (NWR).
3. Obtain coverage (CA) of the farm work using operation period (DWP) and rate of available work days (AWDR).
4. Submit paper and FD.

Exercise 2-21.
When Coverage (CA)=3.7ha, Number of operation times (N) =1, Available work days (AWD) =14.6d, Net working hours (Dn) =7.0 h/d, Field Efficiency (FE) =55.0%, obtain Daily Capacity (DC), Effective Field Capacity (EFC) and Theoretical Field Capacity (TFC) of this farm work.

Exercise 2-22.
When Coverage (CA)=60.7ha, Number of operation times (N) =2, Available work days (AWD) =14.6d, Net working hours (Dn) =7.4 h/d, Field Efficiency (FE) =82.0%, obtain Daily Capacity (DC), Effective Field Capacity (EFC) and Theoretical Field Capacity (TFC) of this farm work.

Exercise 2-23.
When Theoretical Field Capacity (TFC) =0.135 ha/h, Speed(V) =1.8km/h , obtain Width(W) of machine for this farm work.