

## TOOLS TO PUT YOUR ESTRUS SYNCHRONIZATION PLAN INTO ACTION

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### Introduction

For cow/calf producers, reproduction is the most economically important trait; anywhere from two to ten times more important than growth or carcass traits depending on assumptions (Boggs and Hamilton, 1997; Glaze, 2011). Consistent, high reproductive performance is contingent on timely year-round management. Once this is achieved, implementation of an estrus synchronization and AI program is much easier but still requires attention to the timing and details of the synchronization protocol and insemination procedures.

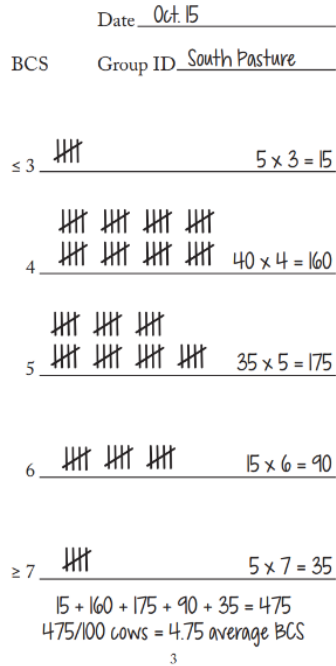
There are several tools that producers can use to improve the likelihood of successful estrus synchronization programs. This paper will focus on body condition scoring, products used to synchronize estrus and tools to plan your synchronization program.

### Body Condition Scoring

A body condition scoring system of 1=emaciated to 9=obese is common in US beef research literature and promoted to US beef producers. USDA's 2017 NAHMS Beef survey reported that 13.6% of all US operations used body condition scoring and this increased to 30.6% of operations for herds over 200 head. Body condition scores are a measure of how well nutrients provided match with the nutrient demand. By deliberately assessing cow condition and recording it at key times, management decisions such as weaning time or supplementation can include this information. Delayed nutritional management decisions can impact the cow, calf at side, future performance of a calf *in utero* and timing of subsequent pregnancy (later rebreeding=lighter weaning weight). Cows that are in adequate body condition at calving and breeding will respond better to estrus synchronization and have higher fertility than thin cows.

Body condition scores can be assigned while cows are individually coming through a chute for activities such as pregnancy diagnosis or vaccination, but also while moving through the herd during routine checks. In the future, a camera over a working chute may be programed to assign a body condition score, but for now it requires more human involvement. Recording the body condition of individuals as they come down a chute can contribute to selection decisions. However, if recording a tag ID or if an individual ID is not available, then just remember it is the body condition of the group that is needed to drive group feeding and management decisions. So merely recording the number of cows in each body condition score category (or use general groups such as thin, adequate, fat) can provide the needed management information. If a few are missed in the recording, you still get a reasonable group assessment. Using this same philosophy, recording body condition when checking the herd takes little time or effort. It doesn't need to be perfect or exact to have value. Have a piece of paper and make simple tally marks in categories as you move through the cows as shown in Figure 1. The KSU Beef Team has developed a body condition scoring record book (<https://bookstore.ksre.ksu.edu/pubs/MF3277.pdf>) or

<https://bookstore.ksre.ksu.edu/Item.aspx?catId=562&pubId=19320>) which provides a place to record body condition scores and hopefully serve as a reminder to do so.



Based on your projected start of next calving season, you can set a reminder on your smartphone to record body condition at keys times such as 90 days before the start of calving. If you aren't familiar with how to body condition score, there are several ways to learn. Extension publications and video guides are available or work directly with your local county extension professional, beef specialist or other knowledgeable person. Do not let fear of mis-categorizing keep you from scoring cows, just work on consistency. Two adages are very fitting for considering body condition score as a tool for successful reproduction: "you can't manage what you don't measure" and just do it".

### Products used for estrus synchronization

There are several products on the market available for estrus synchronization. These tools need to be used in a manor safe for the person administering the product, in accordance with beef quality assurance (BQA) guidelines and at the correct time and dosage.

**Figure 1.** Tally sheet available in body condition score record book, MF3277

Hormones common to many protocols are prostaglandin F2a (PG), gonadotropin-releasing hormone (GnRH), and progesterins. They are available in the commercial products listed in Table 1.

**Table 1. Commercial names of products\* used for synchronization of estrus.**

Type	Commercial name
GnRH	Cystorelin, Factrel, Fertagyl, GONAbreed, OvaCyst,
PG	estroPLAN, Estrumate, In-Synch, Lutalyse, Lutalyse <i>HighCon</i> , ProstaMate, SYNCHSURE
Progesterin	MGA (melengesterol acetate), CIDR (progesterone)

\*Follow label directions for dose and route of administration.

Most notable on the safety side related to products used for synchronization is awareness that prostaglandin products can all be absorbed through the skin and cause systemic effects. The labels have statements that indicate women of childbearing age, asthmatics, and persons with bronchial and other respiratory problems should exercise extreme caution when handling these products. Use of latex or similar type gloves is recommended for the person administering prostaglandins.

While the GnRH products are not absorbed through the skin, the material data safety sheet does indicate that if skin contact occurs to wash hands with soap and water. So, wearing gloves when

using either GnRH or prostaglandin products is a good safety measure and eliminates the need to remember which group of products is absorbed through the skin.

CIDRs contain progesterone that is intended to be absorbed through the lining of vagina. While the absorptive properties of hands are likely different than vaginal mucosa, using gloves when loading CIDR guns and inserting CIDRs is recommended. The material data safety sheet indicates progesterone is probably carcinogenic to humans. Someone who handled CIDRs without protection on a regular basis could experience chronic effects. The other benefit to wearing gloves when working with CIDRs is that in most cases the person doing this work did not wash their hands before starting this job and could have been working with chemical compounds in the shop or herbicides. Gloves help protect the cows or heifers as well as the person working with the products.

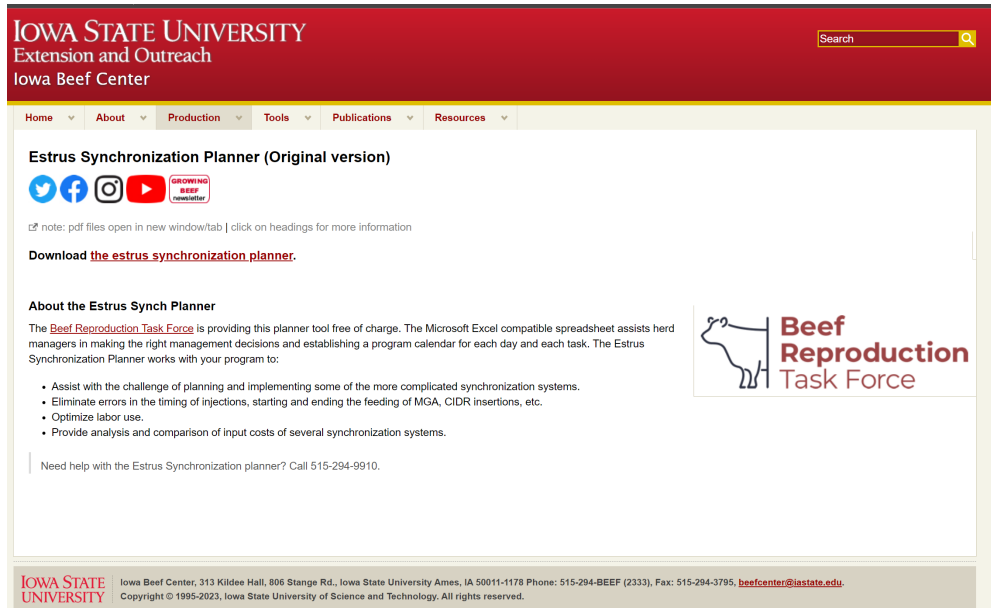
It is easy to get the product type and names shown in Table 1 confused and give a PG product when GnRH is scheduled or vice versa. Or someone on the team may inadvertently bring the wrong product to the working area by mistake or use the wrong dose. The estrus synchronization planner, described next, is one way to try to minimize the potential source of error. Another way is to mark or label products with day and dose of use. Despite our best intentions, this type of mix-up may occur. If it does, several factors will influence the best way to move forward. Contact a member of the Beef Reproduction Task Force ([info@beefrepro.org](mailto:info@beefrepro.org)) or another individual that has a sound understanding of the physiology of synchronization to help determine the next best step.

### **Estrus Synchronization Planner**

The Estrus Synchronization Planner was developed to guide producers in protocol selection and to administer the correct synchronization product at the proper dose on the correct day and time. The prescribed interval between prostaglandin administration and or CIDR removal to fixed-time insemination should be followed closely for the given protocol. Use of the planner will prevent the situation where CIDRs need to be removed at 2 am to stay on schedule. Close attention to details is a characteristic of successful programs.

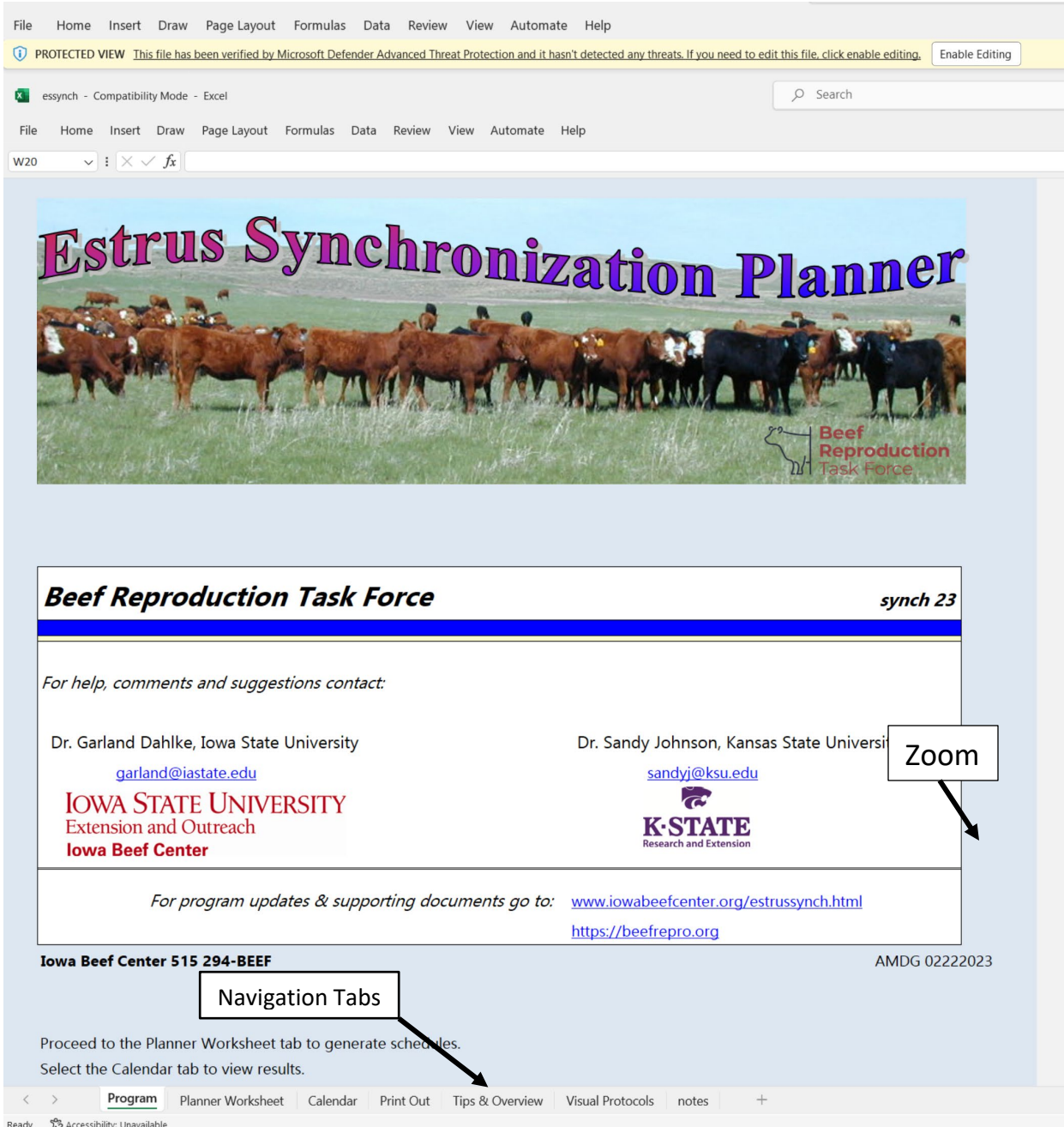
To use the Estrus Synchronization Planner, you will need a copy of MS Excel or Open Office. The planner can be downloaded at no charge from the Iowa Beef Center at <http://www.iowabeefcenter.org/estrussynch.html>. This page also contains additional reference materials related to synchronization of estrus and AI. You will also find tips for downloading and saving your copy of the Estrus Synchronization Planner in two forms; printed document or video. A video on use of the planner is also available, those familiar with spreadsheets will find they need little instruction to run the program. Before you download the spreadsheet, it will ask for your contact information. This is very important as we will contact you by e-mail when updates are made to the planner, generally on an annual basis. The current version is Synch 23 released in February of 2023. Every attempt is made to have the program free from bugs before release. In the rare event you do get an error message or unexpected value, check your version against what is listed at the website and if the error occurs in the current issue please contact one of us: Garland Dahlke ([gdahlke@isu.edu](mailto:gdahlke@isu.edu)) or Sandy Johnson at [sandyj@ksu.edu](mailto:sandyj@ksu.edu).

After registering and submitting the registration form, a page acknowledging your registration appears and provides a link to where you will download the file (Figure 2). Depending on your browser, programs and settings, the file may open in the browser or be listed in your download folder as “essynch.xls”. Screens may vary slightly from those shown here based on browser and software versions.



**Figure 2.** Downloading the Estrus Synchronization Planner.

After opening *essynch.xls*, you will see the Estrus Synchronization Planner program appear on your screen (Figure 3). This program will open in compatibility mode, which will allow it to run in either old or new versions of Excel. You will need to enable editing if the message appears at the top of the spreadsheet. In some cases, you may need to use the maximize button within the worksheet to see all the navigation tabs at the bottom of the program. The zoom features of Excel in the lower right-hand portion of the screen can also be used to modify the size and amount of text shown on the screen.

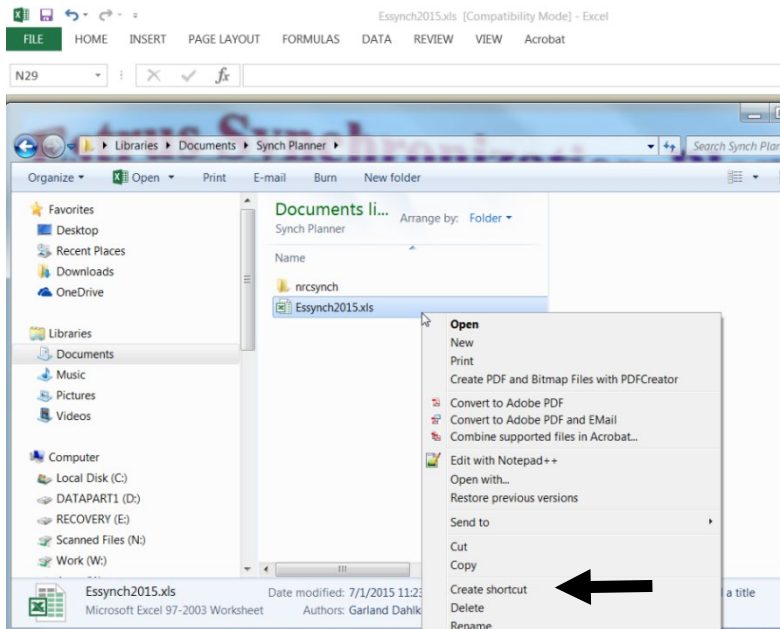


**Figure 3.** Opening screen and basic navigation.

*Saving* - The Estrus Synchronization Planner is a formatted Excel sheet that should be saved to your computer after downloading and opening the program. Once saved to your computer you will not need to go to the download site to operate. Save the program in the desired folder on your computer (FILE- SAVE AS). You may wish to rename “*Essynch2023*” or rename the sheet after the protocol that you have just set up. For those that provide AI service to others, the program can be further customized by adding your name and contact information on the top right-hand side of the *Planner Worksheet*. Saving after this addition will avoid the need to re-enter each time you

use the program. To save the program follow the normal save routine as you would for any spreadsheet developed with your version of Excel.

*Create a shortcut* - To create and save a shortcut for this program on your desktop ‘right-click’ while the *Essynch2023.xls* file that you have downloaded is highlighted in File Explorer view and a menu will appear (Figure 4). Select ‘Create Shortcut’ from this menu and you will see a new icon appear that will be labeled as a shortcut. Drag this new icon on to your Desktop or where ever you would like to place the shortcut.



**Figure 4.** Creating a desktop shortcut.

*Basic Excel features* – The Estrus Synchronization Planner is made up of several worksheets whose names appear on navigation tabs (Figure 3) at the bottom of the screen: *Program, Planner Worksheet, Calendar, Printout, Tips & Overview, and Visual Protocols*. Click on the appropriate tab to move throughout the program. The *Tips and Overview* section provides some basic definitions and guide to operation. The *Visual Protocols* tab shows the short list of recommended protocols for cows and heifers from the Beef Reproduction Task Force and found in major sire catalogs. In the *Planner Worksheet* you will see several small red triangles (Figure 5). As you move your mouse over each one, comment boxes will appear that provide definitions or explanations. To make or change an input (white boxes), click in the white box and begin typing. Default format for dates is MM/DD/YY and for times hh:mm am/pm. After you have clicked in an input box you can use the F2 key to edit the contents. This is particularly helpful for the date and time cells. An incorrect date format will result in errors.



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## Estrus Synchronization Planner

Enter inputs here. (Notice the format for time.)

Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
Town: \_\_\_\_\_  
Phone Number: \_\_\_\_\_  
Group: \_\_\_\_\_  
Prepared by: Sandy Johnson  
Phone Number: 785-462-6281

Move your mouse over the red triangle to see helpful information

Replace the example inputs (below) with your own.

System Type: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

Synchronization Protocol: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

Date to Start Breeding: 6/1/2023

Time of Day To Breed: 8:00 AM

GnRH: 1

PG: 2

Bull Turn In: \_\_\_\_\_

Gestation Length: \_\_\_\_\_

Calendar Printout Notes: \_\_\_\_\_

Output

Expected Calving Date: 3/8/2024

Remove CIDR: 5/13/23 2:00 PM

Last PG Injection: 5/29/23 2:00 PM

Trips Through Chute: 4

Head Worked per Hour (AI): 32

Group Size (head): 44

Cost Comparison

Alternative System 1: \_\_\_\_\_

Alternative System 2: \_\_\_\_\_

Preferred Fixed-Time AI - Cow Protocols

22 = 7 Day CO-Synch + CIDR -- Fixed-Time AI 63 +/-3

29 = 5 Day CO-Synch + CIDR -- Fixed-Time AI 72 +/-2

39 = 7 & 7 Synch -- Fixed-Time AI 66 +/- 2

Preferred Fixed-Time AI - Heifer Protocols

23 = 7 Day CO-Synch + CIDR -- Fixed-Time AI 54 +/- 2

27 = MGA + PG -- Fixed-Time AI 72 +/- 2

32 = 14 Day CIDR + PG -- Fixed-Time AI 66 +/- 2

Program Planner Worksheet Calendar Print Out Tips & Overview Visual Protocols notes

## Use of the Planner

**Figure 5.** Enter your values in the white input boxes.

To begin using the planner, click on the *Planner Worksheet* (Figure 5) tab to select desired inputs. In the top right-hand corner, you can enter information to identify the producer and group of cattle. This information will transfer to the calendar and print out portions automatically.

*Breed Type* - In the Input portion of the spreadsheet enter “1” for *Bos taurus* or “2” for *Bos indicus* (50 % *indicus* breeding or greater).

*System Type* - Protocols are grouped based on how much if any heat detection is required; 1) AI after observed estrus (greatest time requirement for heat detection), 2) AI after observed estrus followed by clean-up fixed-time AI or 3) strict fixed-time AI (no heat detection). Enter 1, 2, or 3 in the input box to make the appropriate selection. When the “detection-insemination type” is changed from 1 to 3, the recommended protocols listed changes based on that selection. Select a synchronization system by entering a number from the listed systems for cows or heifers. The short list of recommended protocols is different for cows (listed to the left) and heifers (listed to the right). The timing of insemination differs for some protocols between cows and heifers. Other reasons for differences include that use of MGA (melengesterol acetate) is only approved for use in heifers. Additionally, heifers do not seem to respond as consistently to GnRH and some heat detection systems for heifers will not include GnRH whereas it is included for cows. Systems listed as “less preferred” generally require additional handlings and/or costs with no improvement in results, or do not work on non-cycling animals.

*Date to start breeding* - Entering the date to start breeding provides the expected calving date in the Output cells to the right (Figure 5, circled). The calving date is based on a 281-day gestation length. This will be the day of fixed-timed AI for strict fixed-time insemination or the day you can begin heat detection in systems requiring heat detection.

*The time of day you want to breed (midpoint Fixed-time AI)* becomes important for protocols that use fixed-time AI or clean-up fixed-timed AI. Only synchronize as many females as you can comfortably inseminate in a 3 to 4-hour period in the given situation. You can enter the number of head you can inseminate per hour and the total number in the group. A “reduce breeding group size” message will appear when you have at least one more animal than what you can breed in 3 hours. This is a conservative number to account for times when things don’t happen as quickly as expected. Enter the midpoint of the time of day you want to conduct fixed-timed AI and check the time of day for CIDR removal or PG injection to the right under the Output section. This will help you meet the specified interval prescribed for the protocol. Trial and error may be needed so that PG injection/CIDR removal and AI both occur at workable times. Or review Table 2 to see common times used. To get the best response from the selected protocol it is important to follow the schedule and timing of activities as described. Fixed-timed insemination systems require a precise interval between CIDR removal and timed AI. By asking what day and time you want to begin breeding, the planner calculates the precise day and hour other treatments of the protocol should be administered.

**Table 2.** Common times for treatment and AI to achieve desired intervals for fixed-time AI

System	Interval	CIDR Removal/PG	Timed AI
Cow - 7 Day CO-Synch+CIDR	63 hrs.	5 pm	8 am
Cow - 5 Day CO-Synch+CIDR	72 hrs.	8 am	8 am
Heifer - 7 Day CO-Synch+CIDR	54 hrs.	1 pm	7 am
Heifer - MGA + PG	72 hrs.	7 am	7 am
Heifer - 14 Day CIDR+PG	66 hrs.	2 pm	8 am
		7 pm	1 pm
Heifer - 5 Day CO-Synch+CIDR	60 hrs.	7am	7 pm

For example, let’s plan a fixed-timed AI program for 180 head of heifers using the 14 Day CIDR+PG system with fixed-timed AI to occur  $66 \pm 2$  hours after CIDR removal. Based on past experience in the given facilities and associated crew, 60 head can be inseminated in one hour. The heifers can be gathered and in the holding pen by 8 am and 3 hours will be needed for insemination. The midpoint between 8 am and 11 am is 9:30 am. We put 9:30 am as the time we want to breed in the planner, the planner returns a time to give the prostaglandin (PG) injection of 3:30 pm. This would be our mid-point to give PG. If the estimated amount of time required to give PG is 1 hour, we would start giving PG at 3:00 pm. If a group of heifers consisted of 10 head with adequate facilities and insemination would take less than an hour, then plan to start breeding at 8 am and start giving PG at 2:00 pm with no further adjustments. With 66 hours as the target interval to fixed-time AI, the calendar portion of the planner (Figure 6) shows the range to complete timed AI at 7:30 to 11:30 AM.



# Estrus Synchronization Planner

Heifer System

9/15/23

32=14 Day CIDR+PG -- Fixed- Time AI 66 +/-2

Producer Name:  
Address:  
Town:  
Phone Number:  
Group:  
Prepared by: Sandy Johnson  
Phone Number: 785-462-6281

Date to start breeding: 6/1/2023  
Clean-up bull turn in date: 6/15/2023  
Start of calving season: 3/8/2024

EDA = estrus detection aid  
GnRH= Zcc Cystorelin  
PG= 5cc Lutalyse

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Complete Fixed Time AI between:		6/1/2023 7:30 AM		and		6/1/23 11:30 AM	
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
4/23/2023	4/24/2023	4/25/2023	4/26/2023	4/27/2023	4/28/2023	4/29/2023 <small>(no time constraint)</small> <small>*Insert CIDR device -all females</small>	
4/30/2023	5/1/2023	5/2/2023	5/3/2023	5/4/2023	5/5/2023	5/6/2023	

**Figure 6.** Top portion of calendar sheet showing range of times to complete timed AI.

*GnRH product/ PG product* - If you would like the name of the specific GnRH (Gonadotropin-releasing hormone) or prostaglandin (PG) product you are using to show up on the calendar or other print outs, select the number corresponding to the appropriate product. The labeled dosage will show up on the output sheets. If the specific product is unknown at the time, zero, the default, will return GnRH or prostaglandin on the output. The right product must be given on the right day and at the correct dosage for a synchronization protocol to work.

*Days from last AI to bull turn in* - The interval from the last AI to bull turn in can be indicated so it will be shown on the calendar. Generally, if identifying AI sired calves is not a priority, bulls can be turned out the day after AI. However, if correct identification of parentage is critical, consideration should be given to the method of sire identification and timing when planning bull turnout.

*Alternative System 1/Alternative System 2* - A cost comparison can be done on up to two alternative systems. Select a number from the protocol lists. Systems do not need to be of the same system type.

The lower portion of the *Planner Worksheet* has input areas to estimate costs (Figure 7). The feed/yardage costs are only figured into MGA programs. The default labor estimate is based on the number of working days in a particular system and the group size. This includes gathering, sorting, synchronization treatments, heat detection and AI service (Loeske, 1989). Users can override this value and enter their own estimate of total number of hours of labor for the cost analysis. User defined charges can be added. To complete the cost analysis, enter your own values for the cost of various inputs. If no cost information is needed, proceed directly to the program outputs (Calendar and Print Out tabs). Updated cost information is not needed to continue.


Preferred Fixed-Time AI - Cow Protocols		See Protocols	Preferred Fixed-Time AI - Heifer Protocols	
22 = 7 Day CO-Synch+CIDR -- Fixed-Time AI 63 +/-3			23 = 7 Day CO-Synch+CIDR -- Fixed-Time AI 54 +/- 2	
29 = 5 Day CO-Synch+CIDR -- Fixed-Time AI 72 +/-2			27=MGA + PG -- Fixed-Time AI 72 +/-2	
39=7 & 7 Synch -- Fixed-Time AI 66 +/- 2			32=14 Day CIDR+PG -- Fixed- Time AI 66 +/-2	
			38 = 5 Day CO-Synch+CIDR -- Fixed-Time AI 60 +/- 4	
			48=7 & 7 Synch -- Fixed-Time AI 54 +/- 2	
Other Systems			Other Systems	
10 = CO	Note the associated costs of the synchronization protocol can be indicated here. The feed/yardage costs are only figured into the MGA programs. The labor (hours) required is estimated. These figures do not need to be updated to run the program.			/-2
13 = Ov				
35 = PG				
* note				
Cost Data				
Remove the example data below and provide your own realistic values				
Head in group:	180	Forage:	Daily Lbs./Hd. 20	Cost / Lb \$0.060
Labor Estimate:	67.9 hours	Grain:	4	\$0.125
Labor Charge:	\$20.00 \$/hour	MGA:	1	\$0.200
Yardage:	\$0.45 \$/hd/day	Supplement:	0.25	\$0.250
			5cc Lutalyse (\$/dose):	\$2.80
			2cc Cystorelin (\$/dose):	\$2.90
			CIDR (\$/insert):	\$13.00
			Semen (\$/unit):	\$30.00
MGA Days:	0	User Defined Charges:		
Drylot Days:	36	Name of Item:	Ultrasound	No.Units 180
Days for System:	34	Name of Item:	patches	No.Units 180
		Name of Item:		No.Units
				Cost - \$/Unit: \$4.50
				Cost - \$/Unit: \$1.25
				Cost - \$/Unit:

Figure 7. Cost input section of *Planner Worksheet*.

## Program Output

Depending on the priority of the users, the next step would be to go to either the *Calendar* tab or the *Print Out* tab. The *Print Out* tab gives comments on using the selected synchronization system and then a written summary of what needs to occur each day (Figure 8). The next section of this worksheet (Figure 9) gives a summary of the immediate costs of using the system along with the costs of the alternative systems selected on the *Planner Worksheet*. Costs are broken down into synchronization cost, AI cost, total cost per synchronized female, feed and yardage cost (MGA systems only) and total cost. The bottom section (Figure 9) gives a cost per pregnancy based on the estrous response rate and conception rate.

To see how the selected synchronization system falls on the calendar (missing Grandma's birthday party or when help will be home from school) go to the *Calendar* tab to see the agenda in a calendar format (Figure 10). If the system or the dates don't work, then go back to the *Planner Worksheet* to make the needed changes and re-evaluate. Select PRINT from your Excel menu to print the *Calendar* or *Print Out* output. To create a pdf version of the output to share electronically, use the print command in Excel (FILE – PRINT - PRINTER) and change the printer to Adobe PDF or other pdf printer. It will ask you to name the file and where to save it. The PDF document can be printed to paper or attached to an e-mail message.



**Beef Reproduction Task Force synch 23**

## Estrus Synchronization Planner

**Heifer System**

9/15/23

Producer Name: 0

Address: 0

Town: 0

Phone Number: 0

Group: 0

Prepared by: Sandy Johnson

Phone Number: 785-462-6281

**Date to start breeding:** 6/1/2023

**Clean-up bull turn in date:** 6/15/2023

**Start of calving season:** 3/8/2024

32= 14 Day CIDR+ PG -- Fixed- Time AI 66 +/-2

Estimated average number of times per head through the working facility: **4**

**Comments**

A reliable fixed-time AI system for heifers.

No estrus detection required, however, 4 trips through working facility are needed.

Fixed time AI can be done 66 hours post PG injection.

This system can initiate estrous cycles in some noncycling females.

Date of Activity	Day of the Week	Description of Activity
<input type="checkbox"/> 04/29/2023	Saturday	Insert one CIDR device in each female. ( no time constraint )
<input type="checkbox"/> 05/13/2023	Saturday	Remove the CIDR device from each female. ( no time constraint )
<input type="checkbox"/> 05/29/2023	Monday	Inject 5cc Lutalyse (PG) in all females.  3:30 PM
<input type="checkbox"/> 06/01/2023	Thursday	Inject 2cc Cystorelin (GnRH) to all females.  Fixed Time AI between: 7:30 AM                      11:30 AM
<input type="checkbox"/> 06/15/2023	Thursday	Turn clean up bulls in with females. Immediate addition of clean-up bulls could lead to questions about parentage.

< >
Program
Planner Worksheet
Calendar
Print Out
Tips & Overview
Visual Protocols
not

**Figure 8.** Estrus Synchronization Planner spreadsheet, page 1 of *Print Out* worksheet. Information based on selections made in *Planner Worksheet*.

<b>System Cost Comparison:</b>				23 = 7 Day CO-Synch+CIDR -- Fixed-Time AI 54 +/- 2	27=MGA + PG -- Fixed-Time AI 72 +/- 2	
6 = MGA + Prostaglandin						
<b>Cost Analysis:</b>	<b>Units</b>	<b>Cost/Unit</b>	<b>Total Cost</b>	<b>Total Cost</b>	<b>Total Cost</b>	
5cc Lutalyse Cost	180.00	\$2.80	\$504.00	\$504.00	\$504.00	
2cc Cystorelin Cost	0.00	\$2.90	\$0.00	\$1,044.00	\$522.00	
MGA Supplement	2520.00	\$0.200	\$504.00	\$0.00	\$504.00	
CIDR Cost	0.00	\$13.00	\$0.00	\$2,340.00	\$0.00	
<b>Synchroniaztion Cost Subtotal</b>			<b>\$1,008.00</b>	<b>\$3,888.00</b>	<b>\$1,530.00</b>	
Detect/Mgt.Labor	89.8	\$20.00	\$1,796.12	\$1,175.84	\$960.07	
Semen	180	\$30.00	\$5,400.00	\$5,400.00	\$5,400.00	
Ultrasound	180	\$4.50	\$810.00	\$810.00	\$810.00	
patches	180	\$1.25	\$225.00	\$225.00	\$225.00	
			\$0.00	\$0.00	\$0.00	
<b>AI Cost Subtotal</b>			<b>\$8,231.12</b>	<b>\$7,610.84</b>	<b>\$7,395.07</b>	
<b>Total Cost (not including feed &amp; yardage)</b>			<b>\$9,239.12</b>	<b>\$11,498.84</b>	<b>\$8,925.07</b>	
<b>Cost / Female Synchronized</b>			<b>\$51.33</b>	<b>\$63.88</b>	<b>\$49.58</b>	
<b>Drylot Costs:**</b>						
Days in Drylot			39	0	36	
Forage (units = lbs)	140,400	\$0.060	\$8,424.00	\$0.00	\$7,776.00	
Grain (units = lbs)	28,080	\$0.125	\$3,510.00	\$0.00	\$3,240.00	
Yardage (units = hd-days)	7,020	\$0.450	\$3,159.00	\$0.00	\$2,916.00	
Other Supplement (units = lb:	1,755	\$0.250	\$438.75	\$0.00	\$405.00	
<b>Feed &amp; Yardage Cost Subtotal</b>			<b>\$15,531.75</b>	<b>\$0.00</b>	<b>\$14,337.00</b>	
<b>Drylot Cost per Head per Day</b>			<b>\$2.21</b>			
<b>Total Cost / Female Synchronized</b>			<b>\$137.62</b>			
<b>Cost - Response Analysis:</b>						
6 = MGA + Prostaglandin						
<b>Estrous Response</b>		<b>Conception Rate of those Responding to Synchronization</b>				
<b>Rate</b>		<b>35%</b>	<b>45%</b>	<b>55%</b>	<b>65%</b>	<b>75%</b>
<b>75%</b>	% AI Pregnant	26.3%	33.8%	41.3%	48.8%	56.3%
	\$ per Synch AI Pregnancy	\$166.97	\$129.86	\$106.25	\$89.90	\$77.92
<b>80%</b>	% AI Pregnant	28.0%	36.0%	44.0%	52.0%	60.0%
	\$ per Synch AI Pregnancy	\$161.89	\$125.91	\$103.02	\$87.17	\$75.55
<b>85%</b>	% AI Pregnant	29.8%	38.3%	46.8%	55.3%	63.8%
	\$ per Synch AI Pregnancy	\$157.41	\$122.43	\$100.17	\$84.76	\$73.46
<b>90%</b>	% AI Pregnant	31.5%	40.5%	49.5%	58.5%	67.5%
	\$ per Synch AI Pregnancy	\$153.42	\$119.33	\$97.63	\$82.61	\$71.60
<b>95%</b>	% AI Pregnant	33.3%	42.8%	52.3%	61.8%	71.3%
	\$ per Synch AI Pregnancy	\$149.86	\$116.56	\$95.37	\$80.69	\$69.93
<b>Excludes Yardage+Feed =</b>				<b>\$86.29</b>	<b>per head.</b>	

**Figure 9.** Estrus Synchronization Planner spreadsheet, page 2 of *Print Out* worksheet. Information based on selections made in *Planner Worksheet*. Compares cost of the selected system to chosen alternatives. Cost response analysis shows costs based on varying conception and estrous response rates.

# Estrus Synchronization Planner

Heifer System

9/15/23

6 = MGA + Prostaglandin

Date to start breeding: 6/1/2023  
 Clean-up bull turn in date: 6/21/2023  
 Start of calving season: 3/8/2024

EDA = estrus detection aid  
 GnRH= 2cc Cystorelin  
 PG= Scc Lutalyse



Producer Name: Robert Rancher  
 Address:  
 Town: Rural America  
 Phone Number:  
 Group: Heifers  
 Prepared by: Sandy Johnson  
 Phone Number: 785-462-6281

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
4/30/2023	5/1/2023	5/2/2023	5/3/2023	5/4/2023	5/5/2023	5/6/2023
+ * MGA @ 0.5 mg/hd/day	+ * MGA @ 0.5 mg/hd/day	+ * MGA @ 0.5 mg/hd/day	+ * MGA @ 0.5 mg/hd/day	+ * MGA @ 0.5 mg/hd/day	+ * MGA @ 0.5 mg/hd/day	+ * MGA @ 0.5 mg/hd/day
5/7/2023	5/8/2023	5/9/2023	5/10/2023	5/11/2023	5/12/2023	5/13/2023
+ * MGA @ 0.5 mg/hd/day	+ * MGA @ 0.5 mg/hd/day	+ * MGA @ 0.5 mg/hd/day	+ * MGA @ 0.5 mg/hd/day	+ * MGA @ 0.5 mg/hd/day	+ * MGA @ 0.5 mg/hd/day	+ * MGA @ 0.5 mg/hd/day
5/14/2023	5/15/2023	5/16/2023	5/17/2023	5/18/2023	5/19/2023	5/20/2023
	+ *Many females in heat next 4 days. DO NOT BREED!					
5/28/2023	5/29/2023	5/30/2023	5/31/2023	6/1/2023	6/2/2023	6/3/2023
				(no time constraint) * Detect Estrus & Breed *Inject Scc Lutalyse- all females	+ * Detect Estrus & Breed	+ * Detect Estrus & Breed *Peak Estrus
6/4/2023	6/5/2023	6/6/2023	6/7/2023	6/8/2023	6/9/2023	6/10/2023
+ * Detect Estrus & Breed	+ * Detect Estrus & Breed	+ * Detect Estrus & Breed	+ * Detect Estrus & Breed			
6/11/2023	6/12/2023	6/13/2023	6/14/2023	6/15/2023	6/16/2023	6/17/2023

Figure 10. Estrus Synchronization Planner spreadsheet, Calendar worksheet.

Once the output from the planner has been generated, a number of additional steps should be taken to help ensure a successful synchronization program. Share the output with everyone involved in the project (and your spouse even if they aren't directly involved) and double check for conflicts on their calendars. Post a copy of the calendar in the barn and/or in the area where AI supplies are stored. Mark the synchronization products with date they will be used. Mistakenly administering a GnRH product rather than prostaglandin product (or vice versa) is a common problem.

Make sure necessary supplies are on hand including appropriately sized needles, syringes, gloves, AI sheaths, lube, paper towels and heat detection aids. Test temperature of automatic thaw units. Clean and check condition of insemination gun(s), tweezers and straw cutter. Review record keeping plans and methods. For timed-AI systems you may want to record how much time it took to inseminate, number of cows and number of people helping (perhaps names as that relates to level of experience/ability). This can be used to plan in subsequent years. Check facilities for any needed repairs.

Based on responses of users to a 2013 survey (Johnson and Dahlke, 2015) the Estrus Synchronization Planner has been successful in helping producers with their AI programs. Producers moderately to strongly agreed that the planner made scheduling easier (93%, 140/150), reduced errors in implementing protocols (88%, 123/140), improved communication with those involved with the breeding project (88%, 123/140), and helped to find the most cost effective protocol for their situation (86%, 121/140). The planner guides users to appropriate protocols and based on user inputs, translates selections into dates and times on a calendar.

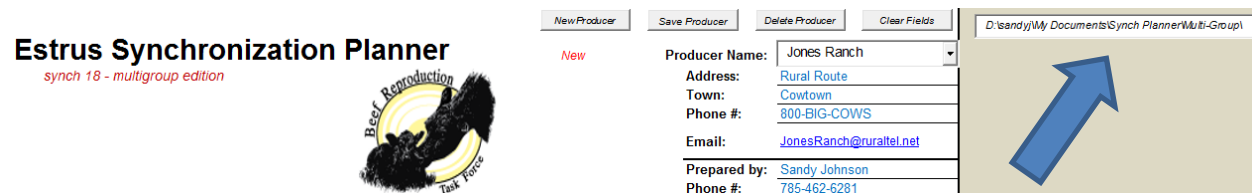
## Estrus Synchronization Planner – Multi-Group Edition

A new version of the Estrus Synchronization Planner, Multi-Group Edition (current version 19.8), is now available (<http://www.iowabeefcenter.org/software.html>) that allows you to show up to 12 different groups of females to be inseminated on a 12-month calendar. Groups could be replacement heifers, 2-year-olds and mature cows or a heifer development enterprise that might breed different groups of heifers daily or weekly. In comparison to the original planner, it has a bit more programming and some users may need a little help to get started. A video with step-by-step instructions as well as written instructions are available from the download site. If you have any questions, please contact one of us for help.

Before using this version for the first time, you will need to enable all macros in Excel. To do so, open Excel, go to File – Options - Trust Center - Trust Center Settings – Macro Settings – and 1) make sure “enable all macros” is indicated and 2) check “Trust Access to VBA project object model”. **You will need Microsoft Excel (Open Office won't work here) and a Windows compatible machine to run this version of the program.**

After downloading the multi-group planner (follow same directions as for the original version), start with the *Planner Worksheet* tab. If you set-up synchronization programs for multiple producers, enter your name and contact information in the upper right corner of the screen and save the program before first use.

The program saves each new synchronization plan in a folder that corresponds to the producer name given at the top. For example if you will be breeding 6 groups for the Jones Ranch, press the “New Producer” button and enter “Jones Ranch” as the Producer Name, including additional contact information as desired. When entry of contact information is complete, hit the “Save Producer” button. This will create a subfolder under the folder that contains the program that is shown within the spreadsheet and in the upper right of Figure 11.



**Figure 11.** Directory location of Multi-Group Planner files on *Planner Worksheet* tab.



Now you are ready to outline the protocol for the first group, much like the original Estrus Synchronization Planner. Give the breeding group a meaningful name, ie. replacement heifers, 2019 Pen 25, etc. as appropriate. Enter the number of head in the group (will be used to generate a list of supplies) and fill in other selections as usual. If you would like to include an early pregnancy check date on the schedule, a date that is 30 days from the start of AI is shown to the right of the input column. This would be the earliest date for preg checking via either ultrasound or a blood test in most situations. It may be more practical to check two weeks or more beyond that and you can enter a date to fit your system. The notes segment could be used to indicate what semen is planned for this particular group or other relevant notes. Once this segment is completed, hit the “Save Producer Plan Below” button. This will result in a sub file under the producer name called “*proto.iaj*”. Repeat this process for the number of groups needed. Making sure to hit Save Producer Plan Below” after each. The next year you can recall the plans for the various groups and modify as appropriate and resave. If you need to save each year’s plans, the “*proto.iaj*” could be placed in a subfolder (ie. 2018) and archived.

Once the plan for each group is completed, go to the *Calendar* tab. Select the producer name from the drop down arrow on the upper left side of the page (Figure 12). Then hit “Load Calendar”.

The screenshot shows the 'Estrus Synchronization Planner' interface. On the left, there is a dropdown menu labeled 'Select producer name from list below' with 'Jones Ranch' selected. Below it are 'Clear Calendar' and 'Load Calendar' buttons. The main area features a logo for 'Beef Reproduction Task Force' and contact information for 'Sandy Johnson' (785-462-6281). A yellow highlight is present on the date 3/20/2018, with a red note: '= may not be adequate time'. Below this is a calendar table with columns for Sunday (3/18/2018), Monday (3/19/2018), and Tuesday (3/20/2018).

Sunday	Monday	Tuesday
3/18/2018	3/19/2018	3/20/2018

**Figure 12.** Load producer’s calendar on *Calendar* tab.

The calendar should populate with the plans you have entered. If you have multiple activities on one date (remove CIDRS and insert CIDRs), that date is shaded in gold (Figure 12) to draw your attention so you can make sure both tasks can be completed on the same day or time period. In this case, the time of day the CIDR is inserted for “JimBobs Cows” is not critical and can be completed earlier in the day. Prior to printing, you can select text in each calendar segment and change the print color and font (Figure 13) using routine Excel commands. This would allow all activities for one group to be coded in the same color. If you may need to reprint the same calendar later and have formatted the text, you should save the calendar by printing to a pdf file as the program will not save the formatting.


5/4/2018	5/5/2018
	• 2018 Hfrs Turn in Bull Power 4:00 PM JoBobs cows CIDR in+Inject 2cc Cystorelin-all cows
5/11/2018	5/12/2018
*	 4:00 PM JoBobs cows Pull CIDR+Inject 2cc HiConc.Lut.-all cow 4:00 PM JimBobs Cows CIDR in+Inject 2cc Cystorelin-all cows
5/18/2018	5/19/2018
	4:00 PM JimBobs Cows Pull CIDR+Inject 2cc HiConc.Lut.-all cow
5/25/2018	5/26/2018
• JoBobs cows Turn in Bull Power	4:00 PM Dads Cows CIDR in+Inject 2cc Cystorelin-all cows

Figure 13. Calendar page with conflicting activities (\*) and use of color to distinguish groups.

Below the calendar and on last printed page is a summary of each group (Figure 14). Notes placed on the first page show up here and additional text can be added.

NOTES			
32			
<b>Group</b>	2018 Hfrs	<b>Head</b> 50	<b>Hrs/Run</b> 0.67
<b>System</b>	32=14 Day CIDR+PG with Fixed- Time AI 66+/-2		
<b>PG</b>	50 doses	<b>GnRH</b> doses = 50	<b>CiDRS</b> 50
<b>Notes</b>	<b>Early Preg Date</b>	<input type="text" value="6/10/18"/>	<b>Due</b> <input type="text" value="1/31/19"/>
<i>Deworm and vaccinate 3/23/18</i>			
22			
<b>Group</b>	JoBobs cows	<b>Head</b> 150	<b>Hrs/Run</b> 2.00
<b>System</b>	22 = 7 Day CO-Synch+CIDR with Fixed-Time AI 63 +/- 3		
<b>PG</b>	150 doses	<b>GnRH</b> 300 doses	<b>CiDRS</b> 150
<b>Notes</b>	<b>Early Preg Date</b>	<input type="text" value="7/1/18"/>	<b>Due</b> <input type="text" value="2/20/19"/>
<i>Hereford semen</i>			
22			
<b>Group</b>	JimBobs Cows	<b>Head</b> 150	<b>Hrs/Run</b> 2.00
<b>System</b>	22 = 7 Day CO-Synch+CIDR with Fixed-Time AI 63 +/- 3		
<b>PG</b>	150 doses	<b>GnRH</b> 300 doses	<b>CiDRS</b> 150
<b>Notes</b>	<b>Early Preg Date</b>	<input type="text" value="7/1/18"/>	<b>Due</b> <input type="text" value="2/27/19"/>
<i>Red Angus Semen</i>			

Figure 14. Notes page on bottom portion of Calendar Tab.

A supply list is available on the Supplies tab (Figure 15). It provides summary of number of animals in each group and can calculate total costs of supplies listed.

		Doses		Doses					
Group	Head	HiConc.Lut.	Cystorelin	CIDRs	Needles	Patches	Sheaths	Sleeves	
1 2018 Hfrs	50	50	50	50	10		50	50	
2 Jr's Cows	150	150	300	150	45		150	150	
3 Dad's Cows	150	150	300	150	45		150	150	
4 Mom's Cows	225	225	450	225	67		225	225	
5	0								
6	0								
7	0								
8	0								
<b>Totals</b>	<b>575</b>	<b>575</b>	<b>1100</b>	<b>575</b>	<b>167</b>	<b>0</b>	<b>575</b>	<b>575</b>	

Dose (count) per Unit	50	5	50	100		50	100
Cost per Dose	\$2.80	\$2.90	\$11.00	\$15.50		\$0.12	\$0.13
Units Needed	12	220	12	2		12	6
Total \$	\$1,680.00	\$3,190.00	\$6,600.00	\$3,100.00		\$72.00	\$78.00
					<b>SubTotal \$</b>		<b>\$14,720.00</b>

Figure 15. Supplies tab.

### Mobile version of Planner

The Estrus Synchronization Planner is also available for use on your mobile device (EstrusSynch). Direct your browser to [www.estrussynch.com](http://www.estrussynch.com) for this web-based application that requires a wireless signal or other internet connection to operate. The program has the most critical but not all of the features of the full version of the Estrus Synchronization Planner. Protocol updates in the mobile version may lag slightly behind the spreadsheet version.

Input your choices on the first page (Step 1, Figure 15). Breed type, age, date to start breeding, time of day and insemination method are selected from drop down choices. You must enter a value into the “head in group” box and “days from last AI to bull turn in” to continue. The up and down arrow keys can be used to adjust up or down the number of “head in a group” or other numeric values or prices. When entries are complete, use the “next” button to continue.

**Estrus Synchronizer**  
estrus synchronizer planner

**Herd Information** Step 1  
**Select System** Step 2  
**Results** Step 3

a collaborative effort between:  
Southeast Cattle Advisor  
Iowa Beef Center  
Repro Task Force

### Herd Information

Breed Type:  
Bos taurus

Age:  
Cow

Head in group:  
100

### Breeding Program

Date to start breeding:  
10/8/2014

Time of day:  
8:00 AM

Insemination method:  
Fixed-Time AI

Days from last AI bull turn in:  
10

### Input Costs

Labor costs (\$/hr):  
13.5

PG (\$/dose):  
2.8

**Figure 15.** Input screen, Step 1, of the Estrus Synchronization Planner App.

In Step 2 (Figure 16), select one of recommended protocols by clicking on the desired system. Comments related to the system selected appear in the lower portion of the screen. If the desired system is not shown, use the “back” button to change the “insemination method”. Return to Step 2 and look for desired system; hit “next” to move on.

The results from the selections are shown in Step 3 (Figure 17). The labor hours estimated are calculated the same way as in the full version of the planner. Total cost reflects the number of animals entered in Step 1. The breeding schedule created can be shared via e-mail.

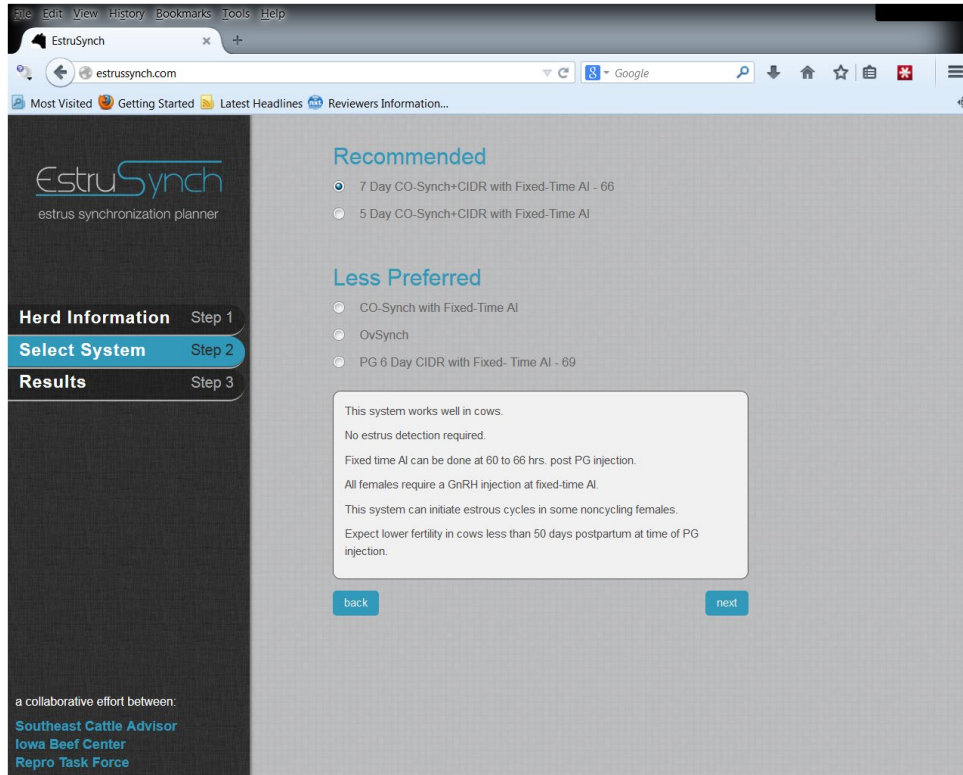


Figure 16. System selection input screen of Estrus Synchronization Planner App.

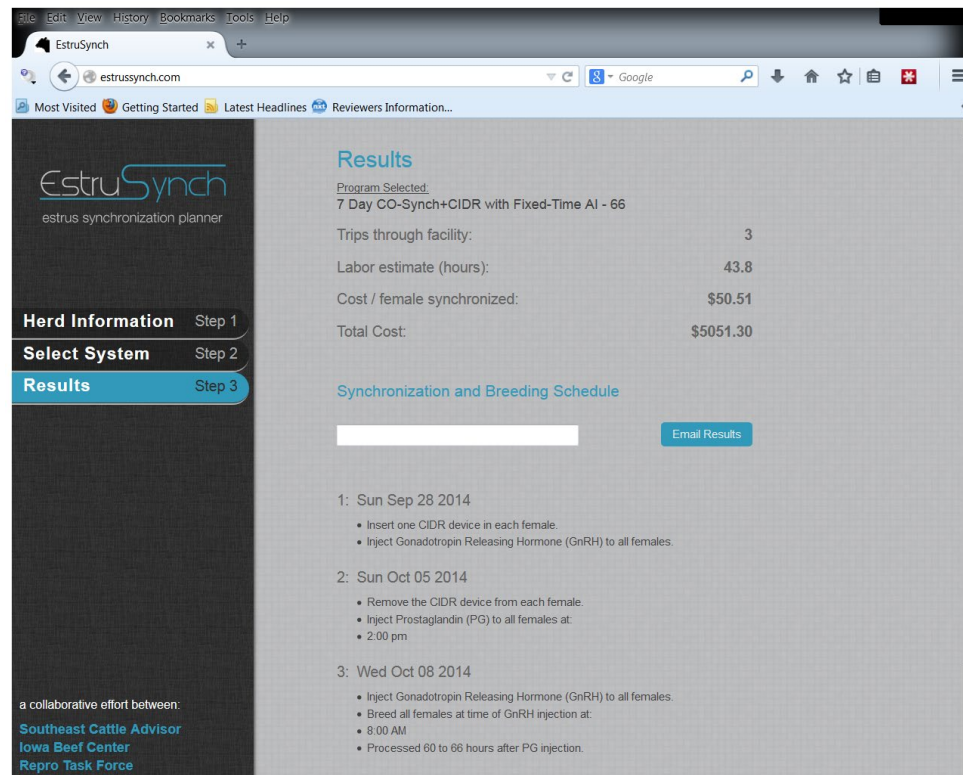


Figure 17. Results screen of Estrus Synchronization Planner App.



## **Management Minder for year-round planning**

To help ensure that year round management steps happen in a timely manner use the Management Minder. The Management Minder is a free web-based annual production calendar that helps you organize and manage your cattle operation. By charting out key annual activities such as breeding, grazing and weaning, you can increase your efficiency, productivity and profit. The program will create a list of activities and dates that can be imported into electronic calendars such as Outlook, Google or Yahoo.

You can get started with the Management Minder by going to: [www.KSUBeef.org/ManagementMinder](http://www.KSUBeef.org/ManagementMinder) or <http://www.iowabeefcenter.org/software.html> . You will find links to training videos, a user guide and the program on this site. Follow the links to register your farm/ranch name. Once registered you will logon to start using the program. You may add other family members, employees, consultants or veterinarians to the account so they may add items to the same calendar.

The Management Minder contains a list of activities that you can add to your calendar and a suggested date based on a default interval from a key time point such as the start of breeding (or calving). You can easily edit the default dates to fit your unique operation.

To make sure you have cows in the optimal body condition for calving and rebreeding, the Management Minder can remind you to take timely body condition scores and make needed adjustments to rations at the start of the third trimester or at calving. You can also use the calendar to remind you to obtain vaccines and supplies for processing calves or pregnancy checking cows. Links to reference materials provide in depth information on some topics. Examples of activities or dates you might include on your calendar are shown in Table 2.

Once you've set up your calendar, the items from one calendar year can be automatically sent to the next calendar year, minimizing your set-up time. Your calendar can be uploaded to existing calendar formats including Outlook, Google or Yahoo. It can be printed or loaded on a mobile phone.

The program can be accessed from mobile devices, however our preference is to do the initial set up on a larger screen of a desktop or laptop machine to see more of the choices at one glance. This may merely be a limitation of smart phone skills of the authors.

**Table 2.** Example of calendar activities that can be added from the Management Minder.

<b>Date</b>	<b>Example activities</b>
1/11/2019	Replacement heifer check weight #1
1/15/2019	Check calving supplies and facilities
1/22/2019	Get started on shopping for new sires
1/30/2019	Begin evening feeding 2-year olds
2/13/2019	Calving begins 2-year olds (+280 days)
2/16/2019	Begin evening feeding mature cows
2/22/2019	Record calving body condition score mature cows
3/1/2019	Calving begins mature cows
3/10/2019	Replacement heifer check weight # 2
3/10/2019	Plan AI protocol yearling heifers
3/18/2019	Get burn permit
3/23/2019	Body condition score sires
3/23/2019	Semen and Trich test bulls, vaccinate and deworm
3/23/2019	Order products for spring vaccinations and parasite control
3/23/2019	Get semen ordered for AI
3/23/2019	Order AI supplies
3/23/2019	Plan AI protocol
3/25/2019	Pre-breeding vaccinations yearling heifers
3/25/2019	Reproductive Tract Score/Pelvic measurements
4/1/2019	Start High Mg mineral
4/1/2019	Retag/brand where needed
4/1/2019	Pre-breeding vaccinations mature cows
4/1/2019	Test calves for BVD-PI
4/1/2019	Implant non-replacement calves
4/15/2019	Turnout
5/9/2019	AI begins yearling heifers
5/22/2019	Turn in herd sires mature cows
5/22/2019	Record breeding body condition score cows

## Summary

Production and economic goals will drive most management decisions for cow/calf producers. Smaller-sized herds may face more challenges trying to meet nutrient requirements of different age groups. However, AI technology levels the playing field for calf quality, sire selection and ranch productivity.

The Estrus Synchronization Planner Spreadsheet and the associated version for hand held devices should help users select appropriate breeding systems and to deliver necessary treatments in a timely fashion. Follow these steps to use the planner successfully. 1) Download planner or check to see you have the latest version (19.0) but check for periodic updates. 2) Move to the *Planner Worksheet* and determine insemination type (AI after observed estrus, AI after observed estrus and cleanup timed AI, or fixed-time AI). 3) Enter breed type, date to start breeding and time of day to breed (for fixed-time AI systems). 4) Select protocol from list. 5) Review *Calendar* and *Print Out* output and adjust as needed. Use output to communicate with your team members. The new Multi-Group edition (v 19.8) of the Estrus Synchronization Planner is designed for those that will AI multiple groups of animals over several months. To make sure management steps occur in a timely fashion all year, set up your own production calendar with the help of the Management Minder. With these details covered, producers can focus on other aspects of animal nutrition and management, semen handling and insemination technique to further improve AI pregnancy rates.

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