BFMgh

Operation Manual

June 2022

Contents

1. Main procedures of operation

    The BFMgh is an upgraded version of BFM (Builder of Farming Model) tailored for Ghana. BFM is a program to calculate optimal farming plans which clarify the best combination of crop activities and their cultivated acreage to maximize the total agricultural income, based on available farm conditions (such as farmland acreage and labor) and farming indexes on crop activities (yields, sales prices, costs, working hours) (*1) for farmers. This chapter describes the operational procedures from the installation of BFMgh, registration of farm conditions and farming indexes to the preparation of optimal farming plans.

(*1) Crop activities in this manual include inter-cropping and mixed cropping, in addition to monocropping.

1) Installation

    You can download the BFMgh program on the following website:

    https://www.jircas.go.jp/en/database/farm_management_model_for_shfa

    Download the BFMgh.zip file shown on the middle of the page. When decompressing the downloaded file, the BFMgh folder appears, which includes all files to use BFMgh.

2) Start-up

    Right-click the BFMgh.xla file (*2) in the created folders and open the properties. Check the "Unblock" checkbox to the right of "Security" in the tab "General" and click "OK. Double-click the BFMgh.xla file and when the message box "Microsoft Excel Security Notice" appears, click "Show Signature Details" and confirm that the publisher is JAPAN INTERNATIONAL RESEARCH CENTER FOR AGRICULTURAL SCIENCES and click "Trust all from publisher". Double click the BFMgh.xla file in the BFMgh folder to start up Excel. Activate macros to display the Start-up menu of BFMgh (Figure 1). Also, [Add-ins] will be displayed on the ribbon tab. Click "Please read first" under the Start-up menu to display explanations on main functions of BFMgh and contact information for inquiries.

    (*2) The extension ".xla" may not be shown depending on settings of your PC.
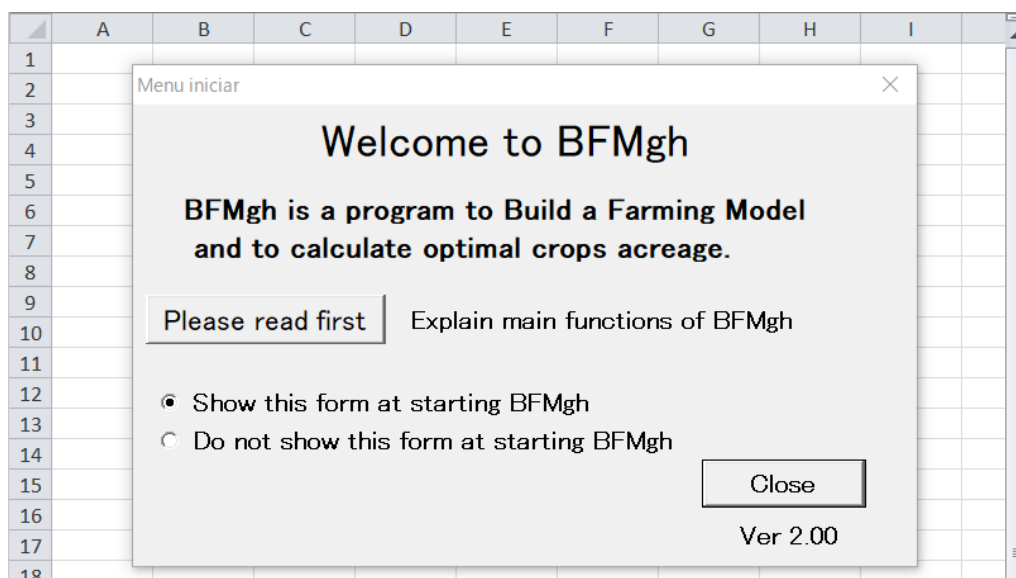
Figure 1 Start-up menu

3) Main functions of BFMgh

Close the Start-up menu and click [Add-ins] tab on the Ribbon to display [BFM], [iData], [fCondition], [Create a farming plan], and [Help] from the left to the right. From [iData] menu, register the farming indexes for crops used for creating an optimal farming plan, and enter farm conditions in the [fCondition] menu. Then, click [Create a farming plan] to create a new optimal farming plan.

You can execute any functions of [iData], [fCondition], and [Create a farming plan] from the [BFM] menu on the leftmost end. You can also execute these functions by right-clicking a cell on the worksheet to display the pull-down menu, where the [BFM] menu is shown at the topmost (Figure 2).

Figure 2 Menu display

4) Entering farming indexes

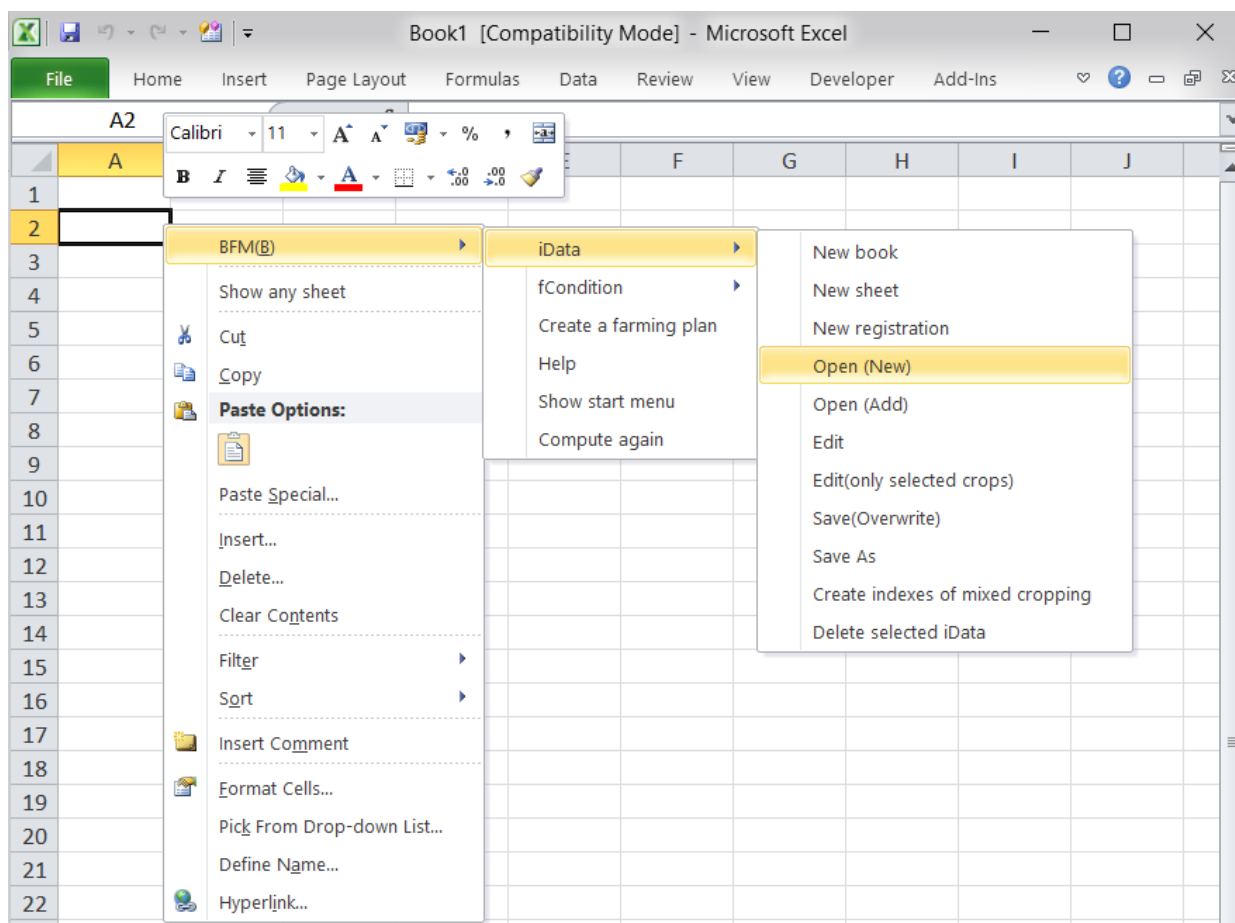First, enter farming indexes for crop activities used for creating an optimal farming plan. This requires data on yields, sales prices, variable costs, working hours for each crop activity.

Click [New registration] on [iData] menu of the [Add-ins] tab to display an index edit sheet (iEdit) shown in Figure 3. Enter farming index data related to crops used for creating an optimal farming plan in the sheet. In principle, please enter data on one crop in one sheet. In case of inter-cropping or mixed cropping, use one sheet for the respective crop, and enter data in each sheet (see p.15 "3. Cautions on use"- "3) To register and use farming indexes for mixed cropping/inter-cropping" for details on data input methods).

First, enter the farming area and crop name in "Area" and "Crop", respectively, of the table under "Summary of farming indexes" on the top of the sheet, and specify, as necessary, cropping system (single cropping, inter-cropping or mixed cropping, crop type, etc.) in "Cropping system, Variety, etc." Next, enter the crop's yield (kg/ha) and unit price (GHc/kg) in the table under "Gross income/ha", variable costs (GHc/ha) in the table under "Variable cost/ha", and the working hour (hour/ha) required for each period (10 days) in the table under "Working hour/ha". Enter the working hour calculated by multiplying the number of necessary workers by the number of days worked and the hours per day (i.e. man*day*hour). In the "Land use" table, enter the land category, the start/end period of cropping. If necessary, enter the acreage in the "Lowest limit of cultivation" and "Upper limit of cultivation" to specify the

upper/lower limit of the crop acreage.

After finishing entry for one sheet (crop), in the menu displayed on the top (from the left, [Add]、[Previous]、[Next]、[Copy]…), click [Confirm] (the fourth item from the right end) to confirm (save) input values. Then, click [Add] to display a new sheet. Enter data on the next crop, and after finishing entry, click [Confirm] to confirm input values. Repeat these steps to register data for all crop activities to be used for creating an optimal farming plan. You can move to the previous or next sheet by clicking [Previous] or [Next]. You can copy the sheet with data entered by clicking [Copy].

After finishing entry of data on all crop activities, click [Close] on the menu. A list of registered crop activities will be displayed on the farming index sheet (iData) (Figure 4). All data on one crop activity are displayed in one row. Click [Edit] in the [iData] menu on the [Add-ins] tab to modify input data, then the index edit sheet will be displayed again.

Figure 3 Index edit sheet (iEdit)

Figure 4 Farming index sheet (iData)

<<Sample of farming indexes>>

If you have no farming index data, or if you just try to create an optimal farming plan, click [Open (New)] in the [iData] menu on the [Add-ins] tab. You can thereby load a sample of farming indexes provided by BFMgh. This sample includes farming indexes (the averages from 2014 to 2019) of five crops cultivated by farmers in a village near Tamale. The five crops are rice (supplementary irrigation) in the rainy season, leafy vegetables in the dry season, both of which were cultivated using small reservoirs as a part of the JIRCAS project, and rainfed rice, maize, and pepper, which are the major crops conventionally grown in this area. Figures 3 and 4 show the farming indexes loaded from the sample.

5) Entering farm conditions

Next, enter farm conditions. Click [New] in the [fCondition] menu on the [Add-ins] tab to display a farm condition sheet (Figure 5). To create an optimal farming plan, enter data on available labor, farmland, machinery/building, subsistence crop, and mixed/intercropped crops. Refer to the following on how to enter data. Data other than those specified as "(optional)" are mandatory to input.

[Labor force]
- Cell D4-E4: "Family labor"
  Enter the number of your family workers engaged in farming and the possible hours to work in a day.
- Cell D9-F9: "Hired labor"
  Enter daily wage and the corresponding working hour. If you do not hire labor, choose "No" in the "Use" (Cell F9).
- Cells J7 to J24/N7 to N24: "Family labor"
  Enter the number of days a family worker can work in the period (for 10 days).
  Note: Exclude holidays and days of rest.
- Cells L7 to L24/P7 to P24: "Hired labor" (optional)
  If you selected "Yes" for the use of hired labor (F9), enter the number of days hired workers can work in the period (for 10 days) in man-hour.
  Example: If a farmer can hire 5 workers in a day for up to 9 days in a 10-day period, enter 45 (5 x 9 = 45). You can also enter "=9*5" (as it will show the same result of 45.)

[Farmland]
- Cell D12: "1) Lowland"
  Enter the acreage (ha) owned in lowland.
- Cell D13: "2) Upland"
  Enter the acreage (ha) of fields owned in upland.
- Cell D20: "Use of rented land"
  If you use rented land, select "Yes" and if not, select "No".
- Cells: E12 to E12 to F13": Rentable land"/"Rent per ha" (optional)

When renting land (selecting "Yes"), enter the rentable land area (ha) and rent for the land per 1 hectare for each type of farmland.

[Machinery/Building] (optional)

- Cells D26 to D28:"1) Machinery"/"2) Building"/"3/ Others"

  If you use any agricultural machines or facilities for work, enter the annual cost for them, including depreciation cost.

[Subsistence crop] (optional)

- Cells I28 to J32: "Subsistence crop"

  If you have subsistence crop in crop activities registered to farming indexes, enter the name of subsistence crop and its production lower limit in "Crop" and ""Qty(kg), respectively.

  Note: See also p.16 "3. Cautions on use"- "4) To input and use data related to subsistence crop".

<< Sample of farm conditions>>

For farm condition sheets, you can load the sample farm conditions for villages near Tamale as described above provided by BFMgh, or averages per farm, by clicking [Open] in the [fCondition] menu on the [Add-ins] tab. Figure 5 shows the farm conditions loaded from the sample.

	A	B	D	E	F	H	I	J	L	M	N	P	Q
1		[FC Farming condition											
2													
3			Number of person	Working hour	–		Number of workable days and hiring days						
4		Family labor	5.0 people	8 hour/day	–		「Family labor」: Number of per capita workable days						
5		–	–	–	–		「Hired labor」: Total number of days you can employ (number of days × number of						
6		–	–	–	–			Family labor	Hired labor			Family labor	Hired labor
7							Jan.Bgn	7.0 days	21.0 days	July.Bgn	7.0 days	21.0 days
8			Daily wage	Working hour	Use		.Mid	7.0 days	21.0 days	.Mid	7.0 days	21.0 days
9		Hired labor	12 GHc	8 hour/day	Yes		.End	7.0 days	21.0 days	.End	7.0 days	21.0 days
10							Feb.Bgn	7.0 days	21.0 days	Aug.Bgn	7.0 days	21.0 days
11		Farmland category	Owned land	Rentable land	Rent per ha		.Mid	7.0 days	21.0 days	.Mid	7.0 days	21.0 days
12		1) Lowland	0.5 ha	0.0 ha	0 GHc		.End	7.0 days	21.0 days	.End	7.0 days	21.0 days
13		2) Upland	1.7 ha	0.5 ha	0 GHc		Mar.Bgn	7.0 days	21.0 days	Sept.Bgn	7.0 days	21.0 days
14		–	–	–	–		.Mid	7.0 days	21.0 days	.Mid	7.0 days	21.0 days
15		–	–	–	–		.End	7.0 days	21.0 days	.End	7.0 days	21.0 days
16		–	–	–	–		Apr.Bgn	7.0 days	21.0 days	Oct.Bgn	7.0 days	21.0 days
17		6) Other	0.0 ha	0.0 ha	20 GHc		.Mid	7.0 days	21.0 days	.Mid	7.0 days	21.0 days
18							.End	7.0 days	21.0 days	.End	7.0 days	21.0 days
19							May.Bgn	7.0 days	21.0 days	Nov.Bgn	7.0 days	21.0 days
20		Use of rented land	Yes				.Mid	7.0 days	21.0 days	.Mid	7.0 days	21.0 days
21							.End	7.0 days	21.0 days	.End	7.0 days	21.0 days
22		–	–				June.Bgn	7.0 days	21.0 days	Dec.Bgn	7.0 days	21.0 days
23		–	–				.Mid	7.0 days	21.0 days	.Mid	7.0 days	21.0 days
24							.End	7.0 days	21.0 days	.End	7.0 days	21.0 days
25		Fixed cost	0 GHc									
26		1) Machinery	0 GHc				Subsistence crop					
27		2) Building	0 GHc				Crop	qty(kg)				
28		3) Others	0 GHc				Maize	1400				
29							Rice	1400				
30												
31												
32												

Figure 5 Farm condition sheet

6) Creating optimal farming plan

We have now completed data input to create an optimal farming plan. See a check box on the

leftmost column (Column A) of the row showing farming indexes on the farming index sheet (Figure 4). Put a check mark on the box to use the crop activity in the row for calculating an optimal farming plan. Finally, click [Create a farming plan] on the [Add-ins] tab. It will create an optimal farming plan sheet containing an optimal farming plan table and chart (Figures 6 and 7).

	A	B	C	D	E	F	G	H	I	J	K
1	[Farming plan]	[Memo space] This table is an optimal plan which is calculated using the data of									
2	Copy	sheet″fCondition″ and sheet″iData″. You can get the new plan by modifying the									
3	Detail of Plan	numerical values (crop acreage, income, cost etc.) in the cream-colored cells.									
4											
5											
6			whole management	Maize	Pepper	Rice Rainfed	Rice Supplementary irrigation	Leafy vegetables Dry season		Rented land acreage Part time days	Land rent Part time Unit price
7		Crop acreage (unit:ha)	2.70 ha								
8		Lowland (ha)	1.00 ha	–	–	0.11	0.40	0.50		0.00 ha	0 GHc
9		Upland (ha)	1.70 ha	0.94	0.76	–	–	–		0.00 ha	0 GHc
15		Quantity of seeds(kg/ha)									
16		Maize		26.5	–	–	–	–			
17		Pepper		–	3.6	–	–	–			
18		Rice		–	–	19.4	92.4	–			
19		Leafy vegetables		–	–	–	–	2.4			
35		Total gross income (GHc)	13,366 GHc	1,274	5,862	361	1,669	4,200			
36		Total variable cost (GHc)	5,971 GHc	688	2,428	226	474	2,155			
37		Proportional profit (GHc)	7,395 GHc	586	3,434	135	1,196	2,045			
38		Fixed costs(depreciation etc.) (GHc)	0 GHc								
39		Land rent (GHc)	0 GHc								
41		Hired labor cost (GHc)	0 GHc							0.0 day	12 GHc
42		Agricultural income (GHc)	7,395 GHc								

Figure 6 Optimal farming plan sheet (Top of screen)

The optimal farming plan shown in Figure 6 indicates that the farmer can achieve the maximal agricultural income (7,395 GHc) by growing rainfed rice (0.11ha) irrigated rice (0.40ha), and leafy vegetables (0.50ha) in lowland, and maize (0.94ha) and pepper (0.76ha) in upland. The crop acreage of rice and maize are enough to produce the amount of 1,400 kg, which was prespecified in "Subsistence crop" on the farm condition sheet as the self-sufficiency requirement of the respective crop. The columns B to G from the top four rows can be used as "Note" space to enter comments on the optimal farming plan.

In Figure 7, the acreage and proportional profit per crop activity are shown in the upper figure. In the lower figure, the upper limits of full-time (family) labor hours are shown by the line graph while the bar graph indicates required labor hours per crop activity per period.
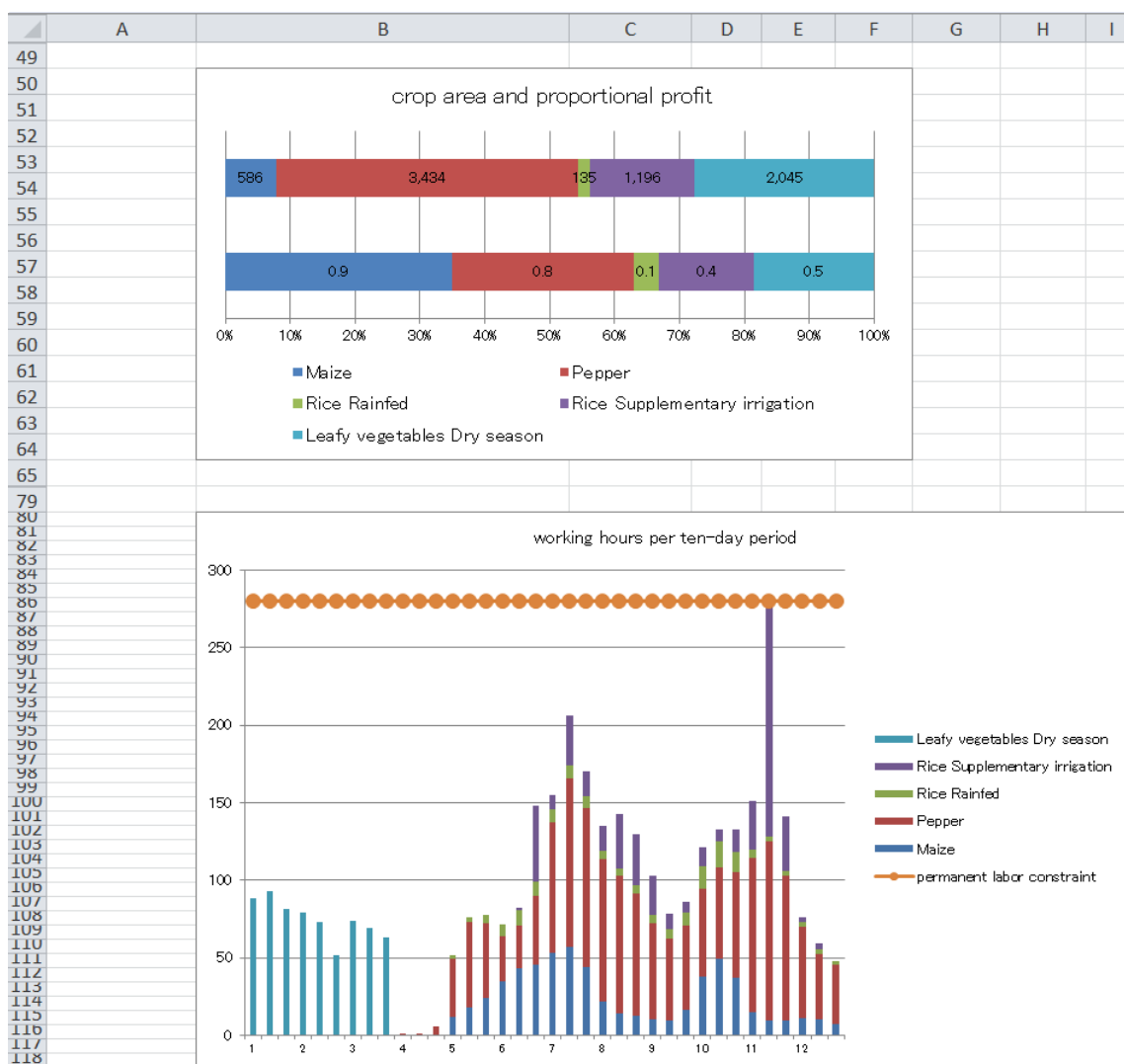
Figure 7 Optimal farming plan sheet (Middle of screen)

7) Optimal farming plan under different farm conditions

The optimal plan shown in Figure 6 cannot yield more than 7,395 GHc of the total agricultural income due to some shortages in family labor. In the bar graph of Figure 7, you can see family labor is fully used in the middle of November. Hired labor may then be used to overcome labor shortage. In the farm condition sheet (Figure 5), select "Yes" for the "Use" of hired labor, and enter "21" in "Hired labor" for each period, assuming that labor of 3 persons for 7 days can be used for every 10 days, for example. Click [Create a farming plan] to create an optimal farming plan sheet. The result will appear in the optimal farming plan sheet (Figure 8). In this plan, the crop acreage for irrigated rice that is labor-intensive and can secure higher profit than rainfed rice increases, boosting the farming income to 7,523 GHc.

You can also examine the optimal farming plan by borrowing farmlands, in addition to changing labor conditions. In the farm condition sheet, select "Yes" for "Use of rented land" and set "0.5" and "1.7" to "Rentable land" in "Lowland" and "Upland" respectively, which enables renting of up to 0.5 ha of lowland and 1.7ha of upland. Click [Create a farming plan] to create an optimal farming plan. The result will be as shown in Figure 9. Comparing this optimal

farming plan to that in Figure 8, the crop acreages for pepper and leafy vegetables having higher profitability than other crops considerably increase, thereby raising the total agricultural income to 15,355 GHc. The introduction of rented land therefore gives a large impact on farming outputs.

Please note that the original optimal farming plan sheet will be overwritten after executing [Create a farming plan]. To save the original farming plan, double-click [Copy] button at the cell A2 on the screen.

	A	B	C	D	E	F	G	H	I	J	K
1	[Farming plan]	[Memo space] This table is an optimal plan which is calculated using the data of									
2	Copy	sheet"fCondition" and sheet"iData". You can get the new plan by modifying the									
3	Detail of Plan	numerical values (crop acreage, income, cost etc.) in the cream-colored cells.									
4											
5											
6			whole management	Maize	Pepper	Rice Rainfed	Rice Supplementary irrigation	Leafy vegetables Dry season		Rented land acreage Part time days	Land rent Part time Unit price
7		Crop acreage (unit:ha)	2.70 ha								
8		Lowland (ha)	1.00 ha	–	–	0.00	0.50	0.50		0.00 ha	0 GHc
9		Upland (ha)	1.70 ha	0.94	0.76	–	–	–		0.00 ha	0 GHc
15		Quantity of seeds(kg/ha)									
16		Maize		26.5	–	–	–	–			
17		Pepper		–	3.6	–	–	–			
18		Rice		–	–	0.0	117.0	–			
19		Leafy vegetables		–	–	–	–	2.4			
35		Total gross income (GHc)	13,449 GHc	1,274	5,862	0	2,113	4,200			
36		Total variable cost (GHc)	5,871 GHc	688	2,428	0	600	2,155			
37		Proportional profit (GHc)	7,578 GHc	586	3,434	0	1,514	2,045			
38		Fixed costs(depreciation etc.) (GHc)	0 GHc								
39		Land rent (GHc)	0 GHc								
41		Hired labor cost (GHc)	55 GHc							4.6 day	12 GHc
42		Agricultural income (GHc)	7,523 GHc								

Figure 8 Optimal farming plan (with hired labor force)

	A	B	C	D	E	F	G	H	I	J	K
1	[Farming plan]	[Memo space] This table is an optimal plan which is calculated using the data of									
2	Copy	sheet"fCondition" and sheet"iData". You can get the new plan by modifying the									
3	Detail of Plan	numerical values (crop acreage, income, cost etc.) in the cream-colored cells.									
4											
5											
6			whole management	Maize	Pepper	Rice Rainfed	Rice Supplementary irrigation	Leafy vegetables Dry season		Rented land acreage Part time days	Land rent Part time Unit price
7		Crop acreage (unit:ha)	3.20 ha								
8		Lowland (ha)	1.00 ha	–	–	0.00	0.50	0.50		0.00 ha	0 GHc
9		Upland (ha)	2.20 ha	0.94	1.26	–	–	–		0.50 ha	0 GHc
15		Quantity of seeds(kg/ha)									
16		Maize		26.5	–	–	–	–			
17		Pepper		–	5.9	–	–	–			
18		Rice		–	–	0.0	117.0	–			
19		Leafy vegetables		–	–	–	–	2.4			
35		Total gross income (GHc)	17,321 GHc	1,274	9,733	0	2,113	4,200			
36		Total variable cost (GHc)	7,474 GHc	688	4,031	0	600	2,155			
37		Proportional profit (GHc)	9,846 GHc	586	5,702	0	1,514	2,045			
38		Fixed costs(depreciation etc.) (GHc)	0 GHc								
39		Land rent (GHc)	0 GHc								
41		Hired labor cost (GHc)	170 GHc							14.1 day	12 GHc
42		Agricultural income (GHc)	9,677 GHc								

Figure 9 Optimal farming plan (with hired labor force and rented land)

8) Simulation of an optimal farming plan

As described above, you can easily create not only an optimal farming plan under actual farm

conditions but also the one under different conditions in the availabilities of farmland and labor force. Moreover, you can simulate the optimal farming plan with different crop acreages, crop yields, sale prices, and so on by changing figures in the yellow cells shown in Figures 6 to 9. Before simulation, you may copy and save the optimal farming plan sheet.

9) Saving input data and calculation results

You can save all input data on farm conditions and farming indexes as well as the created optimal farming plan sheet using the [File] tab of the ribbon on Excel sheets. In such a case, always select "xlsm" or "xls" as an extension for the file to be saved(*).

Input data on farm conditions and farming indexes can be saved individually. In the [Farming indexes] and [Farm conditions] menus, you can select the [Overwrite] or [Save as] sub menu to overwrite saved data or save input/modified data as a new file.

10) Using saved data

You can load all data on farm conditions and farming indexes as well as the created optimal farming plan sheet using the menu item on Excel. You can also load individual files containing saved farm conditions and farming indexes from the [Open] sub menu in [Farming indexes] and [Farm conditions] menus.

(Note) The worksheet used in BFM includes a macro (a type of programs) in a part of the sheet. When saving an Excel file with an extension "xlsm" or "xls", macros will be saved together with input data or calculation results. Files with extensions other than those cannot save macros. When using a file without macro in BFM, an error will occur. To prevent such error, be sure to save a BFM work book or work sheet in an Excel file with an extension "xlsm" or "xls".

2. Menu details

Chapter 1 describes the procedures to create optimal farming plans under the actual management conditions, as well as those under different conditions in the availabilities of farmland and labor force, using BFMgh. You can calculate managerial achievements through introduction of a new technology or new crops and evaluate their economy by using BFMgh, i.e. registering or modifying farming indexes based on the assumption of introducing a new cropping method or new crops, and executing simulation of the optimal farming plan or other trial plan.

This chapter describes all the menus of BFMgh, including those explained in Chapter 1. Menus are shown in different styles on the screen (Figure 2). The style totally changed since Excel 2007, and this manual mainly explains the style applied to Excel (2010). The style applied to Excel (2003) or previous versions is shown in the Appendix.

(1) Types of menus

① Start-up menu: Double-click the "BFMgh.xla" file in the folder where BFMgh is saved, Excel starts up followed by BFMgh, then the Start-up menu appears on the center of the screen. Here, a message to beginners as well as the following menu items are displayed. These are called start-up menu items.

② [BFM] menu in [Menu command] in [Add-ins] on the ribbon: When BFMgh starts up, the [BFM] menu is placed in [Menu command] space in [Add-ins] on the ribbon. This is called the [BFM] menu on the ribbon.

③ [BFM] menu in [Toolbar] in [Add-ins] on the ribbon: When BFMgh starts up, the [iData], [fCondition] and other sub menu items are displayed in [User setting toolbar] on [Add-ins]. These are called [BFM] sub menu items on the ribbon.

④ Right-click menu (context menu): When BFMgh starts up, and one or more workbooks are displayed, right-clicking on the worksheet displays short-cut menus, at the top of which the [BFM] menu is displayed. This is called the right-click [BFM] menu.

Hereafter, the above 4 menus will be collectively called the [BFM] menu, if it is unnecessary to specify any of them.

⑤ Index edit menu: When the index edit sheet is displayed, the [Add], [Previous index], [Next index], [Copy], [Delete], and [Close] index edit menus are displayed on the [User setting toolbar] on the ribbon.

(2) Start-up menu

See Figure 1. Explanations are found next to the menu button.

Click [Please read first] to display an overview of procedures to use BFMgh.

(3) [BFM] menu on the ribbon and right-click [BFM] menu

The same menu items are displayed for the menu bar and shortcut menus on all sheets. Sub

menu items in these two menus are common, except [Re-calculation], the 8th one.

① [iData] consists of the following sub menu items.

- [New book]: A new workbook will be created, and a worksheet having farming index items in the 2nd row will be created.
- [New sheet]: A new worksheet having farming index items in the 2nd row will be created on the current workbook. If there is no current workbook, a new workbook is created.
- [New registration]: Select the [New sheet] menu, then the [Edit] menu described below to open an index edit sheet, where you can register farming indexes.
- [Open (New)]: Load farming index files created by selecting the [Save] menu described below. Please note that the following. When loading from the farming index sheet with farming index data, loaded farming indexes will be added to the sheet. When loading from a sheet other than the farming index sheet with farming index data, existing farming index data will be deleted, then new farming indexes will be loaded.
- [Edit]: Used to add, modify, or delete data on the farming index sheet. When selecting it, the index edit sheet screen will appear. If there is no farming index sheet, it will work in the same way as [New registration] menu.
- [Edit (only selected crops)]: Used to edit only farming indexes having a check mark in the check box in the column A indicating that they are used for an optimal farming plan.
- [Save (Overwrite)]: Saves farming indexes entered in the farming index sheet in a text file with an extension of bfm.
- [Save As]: Saves farming indexes entered in the farming index sheet in a different text file with an extension of bfm.
- [Create indexes of mixed cropping] The respective indexes of mixed crops will be merged into an index of mixed cropping.
- [Delete selected iData] Click on a worksheet row number to delete iData for the selected row.

② [fCondition] consists of the following sub menus.

- [New]: Creates a new farm condition sheet with default values.
- [Open]: Loads a farm condition file created with the [New] menu and saved with the [Save] menu described below.
- [Save (Overwrite)]: Saves data entered in the farm condition sheet in a text file with an extension of bfc.
- [Save As]: Saves data entered in the farm condition sheet in a different text file with an extension of bfc.
- [Change the conditions of labor employment]: Translates the values in [Hired labor] under [No. of workable days and hiring days] in the farm condition sheet as "Upper limit of hiring days for part-time workers] or [No. of days necessary to use part-time workers" alternatively.

③ [Create a farming plan]: Prepares an optimal farming plan model introducing crop activities checked in the farming index sheet with the farm conditions entered in the farm

condition sheet based on linear planning method, then calculates values for an optimal farming plan. Details of the calculation results will be entered in the optimal farming plan sheet.

④ [Help]: Displays the overview of procedures for using BFMgh, just like the one displayed when you select the [Start-up] menu and [Please read first].

⑤ [Show start menu]: Displays the [Start-up] menu. This menu is not displayed on the [BFMgh] menu on the ribbon.

⑥ [Calculate again]: This menu is for users having experiences in creating a linear planning model. You can add or modify constraint conditions in the optimal farming plan model created by BFMgh to create an optimal farming plan. For details, see p.15 "3. Cautions on use" - "5) To modify an optimal farming plan model to create an optimal farming plan".

(4) [BFM] sub menu items on the ribbon

① When farming index sheet and farm condition sheet are displayed, almost the same sub menus as the above-mentioned [BFM] menu on the ribbon or right-click [BFM] menu will appear.

② In the index edit sheet, the following index edit menu will appear.

[Add]: Adds a new index with a new serial number.

[Previous]: Displays the index with a one less serial number than the displayed index (previous index).

[Next]: Displays the index with a one larger serial number than the displayed index (next index).

[Copy]: Copies the index displayed and insert it after the index.

[Working time forward]: Moves forward the data of working time for the index displayed by 10 days.

[Working time backward]: Moves backward the data of working time for the index displayed by 10 days.

[Close]: Closes the index edit sheet and moves to the farming index sheet.

[Confirm]: Updates data registered in the farming index sheet with data for the index displayed.

[Delete]: Deletes the index displayed and reduces the serial numbers of the following indexes by 1.

[Reduction]: Reduces the sizes of characters and cells displayed.

[Expansion]: Expands the sizes of characters and cells displayed.

[Help]: Displays the description of the above-mentioned side-menus in the index edit sheet.

[Show/Hide land coefficients]: Shows/hides the land coefficient. You can change the default of 1 here. Use this option when you are entrusted with farm works without use of your own farmland (coefficient is 0), or when you register the farming index on livestock-related crop activities whose land coefficient is other than 1.

(5) Details of the right-click menus except [BFM]

 ① [Show any sheet]: This item appears immediately below the [BFM] menu. It shows the list of sheets including the hidden sheets. Select a sheet to move to.

3. Cautions on use

1) Index of field usage period

　　Enter the period of using the field for cropping during the phases from plowing, harvesting and processing. Enter the month and period in "Field use/Bgn" and "Field use/End" (at the rows 13 and 14 of the column L and M in the index edit sheet in Figure 3. When omitting the entry in the month, "Field use/Bgn" and "Field use/End" are considered to begin and end in January and December, respectively. When omitting the entry in the period, "Field use/Bgn" and "Field use/End" are considered to begin and end in the first 10 days of the month and the last 10-11 days of the month, respectively. If no data is entered in the field use period fields, the system consider the period from the first 10 days of January to the last 11 days of December, which will disable double-cropping, or cause other inappropriate processing.

2) Entering data related fixed costs

　　The "Fixed cost" space is included in the farm condition sheet. Here, mainly enter the costs related to machinery/building. Machinery/building can be used for more than 2 years, so their acquisition costs are not entered fully here. Instead, calculate a cost of machinery/building for one year (fixed cost) by dividing the acquisition cost by the service life (expected lifespan). Costs not allocated to a specific crop activity but necessary for farming are entered in "Others" space, if any.

3) To register and use farming indexes for mixed cropping/inter-cropping

　　BFMgh creates indexes of mixed cropping/cropping as follows.

(1) How to input data to register the farming indexes of mixed crop activities

　　① Create the farming indexes of the respective mixed crops.

　　② For example, when maize and soybeans are mixed, create farming indexes for "Mixed-A(maize)" and "Mixed-A(soybean)" as the item "Crop".

　　③ Do not enter a space in the item "Crop". Alphanumerics or symbols immediately after "Mixed" are used to distinguish crop activities for multiple types of mixed cropping.

　　④ The costs and working hours that cannot be divided by crop (e.g. land preparation, weeding, etc.) should be all entered in one of the farming indexes of mixed crops or should be divided by the number of mixed crops and enter the average values in the respective farming indexes.

　　⑤ Land coefficients (hidden in a default setting) are left as the default value of 1, as they are automatically calculated by the program.

(2) When using mixed cropping activities to create an optimal farming plan

　　The respective indexes of mixed crops cannot be directly used to create a farming plan, and need to be merged into an index of mixed cropping by clicking on "Make index of mixed cropping" in the iData menu. Click on the checkbox in column A for the created indexes of

mixed cropping as in the case of the single management indicator. You can then create an optimal farming plan that include mixed cropping.

4) How to input and use data related to subsistence crops
(1) Input method
 Enter only the name of crops in the item "Crop" in column D for farming indexes for subsistence crops. However, if a subsistence crop is included in mixed cropping, enter the value just as "Mixed1(maize) as explained in 3).

(2) To create optimal farming plan including subsistence crops
 Enter the name and the required amount (lower limit) of subsistence crops in the "Subsistence crop" space at the bottom right of the farm condition sheet, as shown in Figure 5. When clicking [Create a farming plan] at this point, BFMgh will calculate and create an optimal farming plan that produces the amount of subsistence crops no less than the required amounts you specified. For instance, Figure 6 shows an optimal farming plan that meet the self-sufficiency requirements of maize and rice.

5) To modify an optimal farming plan model to create an optimal farming plan
 This is an explanation for users who already prepared a linear planning model.
 Click the [Move sheet] menu under the right-click [BFM] menu to display a list of sheets in Excel workbooks. Select [Single Item Table.$$$] or [Model.$$$], and add a constraint equation at the bottom of the single item table or formula model. For example, to set the acreage for the 2nd crop activity at a half of that of the 1st crop activity, enter the formula of "X2＝0.5X1". To create an optimal farming plan having the constraint equation, select [compute again] displayed on the right-click [BFM] menu or [Add-ins] on the ribbon.

6) To modify land coefficient
 When including livestock rearing, poultry grazing in the garden, house works, etc.in crop activities, the land coefficient of those activities may be 0 or less than 1. To avoid this, display the land coefficient space by clicking [Show/Hide land coefficients] on the menu of the index edit sheet, and modify it.

4. Appendix

1) The menu display positions in Excel (2003) or previous versions

The menu of BFM in Excel (2003) or lower versions was displayed on the top of the menu bar, or the right-side bar (or the right-click menu on the sheet (Figure 10). In Excel (2007) or subsequent versions, the menu is displayed as shown in Figure 2 on P.3.

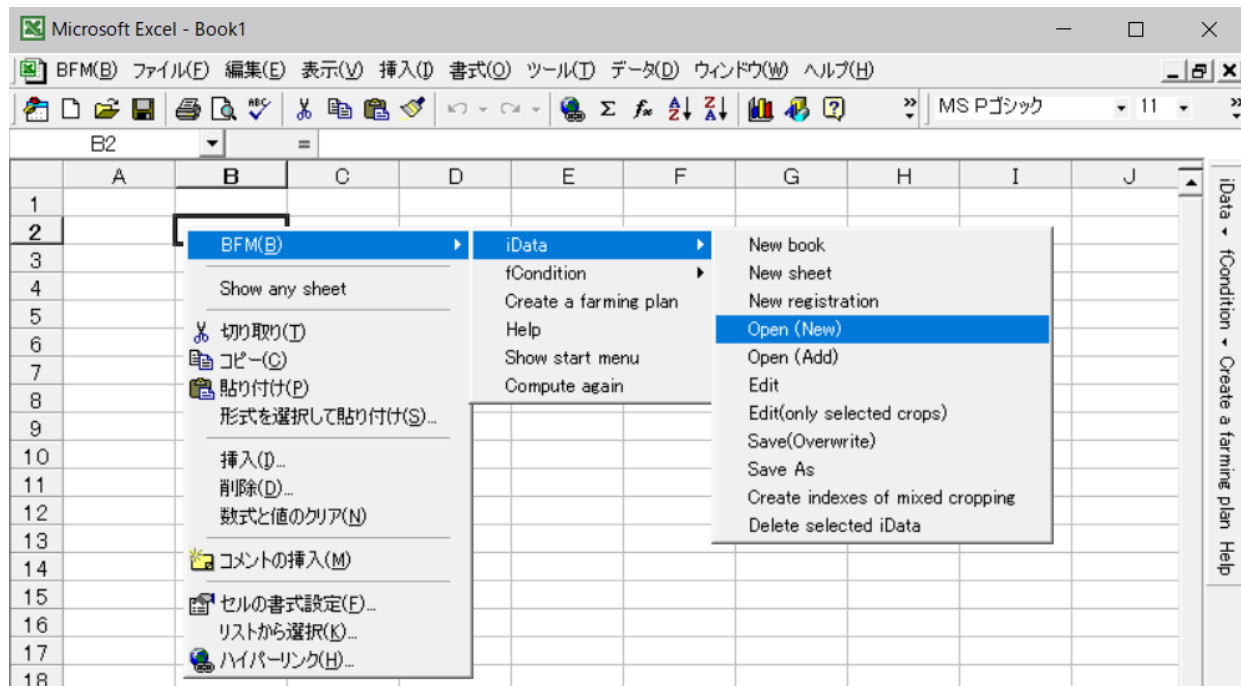The displayed positions and contents of the right-click menu are the same for all versions.

Figure 10 Menu displayed positions