

Supplementary Materials for “A Two-Step Iterative Local Search for the Harvester Scheduling Problem With Splittable Workloads”

S-I. MAKESPAN RESULTS OF TSILS ON DIFFERENT INSTANCES

Two sets of test instances are added to test the performance of TSILS. The first instances set has 15 croplands, while the number of harvesters is varied across [30, 40, 50, 60, 70, 80]. The second instances set has 50 harvesters, with the number of croplands is varied across [5, 10, 15, 20, 25, 30]. The experimental results are shown in Table S-I.

Algorithm S-1: Related Routes Calculation

Input: Solution $S' = \{r_1, r_2, \dots, r_m\}$, cropland c_{single}
Output: Related routes R_{related} coupled with c_{single}

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1 Function RELATIONCAL ( $S'$ ,  $c_{\text{single}}$ ):
2    $LRS \leftarrow \emptyset$ ;
3   foreach  $r_i \in S'$  do
4      $LRS[r_i] \leftarrow \{c_j \mid c_j \in r_i, c_j \neq 0\}$ ;
5    $IDs \leftarrow \{c_{\text{single}}\}$ ;  $R_{\text{related}} \leftarrow \emptyset$ ;
6    $queue \leftarrow [c_{\text{single}}]$ ;
7   while  $queue \neq \emptyset$  do
8      $c_{\text{cur}} \leftarrow \text{pop}(queue, 0)$ ;
9     foreach  $r_i \in S'$  do
10      if  $c_{\text{cur}} \in LRS[r_i]$  then
11         $R_{\text{related}} \leftarrow R_{\text{related}} \cup \{r_i\}$ ;
12        foreach  $c_j \in LRS[r_i]$  do
13          if  $c_j \notin IDs$  then
14             $IDs \leftarrow IDs \cup \{c_j\}$ ;
15             $queue \leftarrow queue \cup \{c_j\}$ ;
16   return  $R_{\text{related}}$ ;

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Algorithm S-2: Connected Cropland Set Analysis

Input: Solution $S' = \{r_1, r_2, \dots, r_m\}$
Output: Disjoint sets of coupled croplands *Sets*

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1 Function FINDCONNECTED ( $S'$ ):
2   foreach  $r_i \in S'$  do
3      $LinkSet[r_i] \leftarrow \{c_j \mid c_j \in r_i, c_j \neq 0\}$ ;
4    $Parent[c] \leftarrow c, \forall c \in C$ ;
5   foreach  $CL \in LinkSet$  do
6     for  $i \leftarrow 0$  to  $|CL| - 1$  do
7       for  $j \leftarrow i + 1$  to  $|CL| - 1$  do
8          $Union(CL[i], CL[j])$ ;
9    $CoupledMap \leftarrow \emptyset$ ;
10  foreach  $c \in C$  do
11     $root \leftarrow \text{Find}(c)$ ;
12    if  $root \notin CoupledMap$  then
13       $CoupledMap[root] \leftarrow \emptyset$ ;
14       $CoupledMap[root] \leftarrow CoupledMap[root] \cup \{c\}$ ;
15   $visited \leftarrow \emptyset$ ;  $Sets \leftarrow \emptyset$ ;
16  foreach  $C_{\text{group}} \in CoupledMap$  do
17    foreach  $c \in C_{\text{group}}$  do
18      if  $c \notin visited$  then
19         $component \leftarrow \text{DFS}(c, visited)$ ;
20         $Sets \leftarrow Sets \cup \{component\}$ ;
21  return  $Sets$ ;
22 Function DFS ( $c_{\text{start}}, visited$ ):
23   $stack \leftarrow [c_{\text{start}}]$ ;  $component \leftarrow \emptyset$ ;
24  while  $stack \neq \emptyset$  do
25     $c_i \leftarrow \text{pop}(stack)$ ;
26    if  $c_i \notin visited$  then
27       $visited \leftarrow visited \cup \{c_i\}$ ;
28       $component \leftarrow component \cup \{c_i\}$ ;
29      foreach  $c_j \in CoupledMap[\text{Find}(c_i)]$  do
30         $stack \leftarrow stack \cup \{c_j\}$ ;
31  return  $component$ ;

```

TABLE S-I
MAKESPAN RESULTS OF TSILS ON DIFFERENT INSTANCES

Instance	Makespan	Running time
M_15_30	573.9381801769072	12.370444059371948
M_15_40	420.7430183991936	10.894626140594482
M_15_50	341.6342418450818	12.030539751052856
M_15_60	278.6664845180986	13.551505804061890
M_15_70	247.6852347330164	14.783986806869507
M_15_80	211.0531359083956	12.206111192703247
M_5_50	142.3947721603693	10.398349523544312
M_10_50	239.4663144584388	12.520165920257568
M_15_50	341.6342418450818	12.030539751052856
M_20_50	430.6686776700778	13.891034126281743
M_25_50	632.5571563045867	15.009512186050415
M_30_50	772.5383630732873	17.550309658050537