

APPENDIX VIII

AGRO-CLIMATIC CONSTRAINT RATINGS

Agro-climatic constraints cause direct or indirect losses in the yield and quality of produce. Yields losses in a rain-fed crop due to agro-climatic constraints have been formulated based on principles and procedures proposed in FAO1978-81a. Details of the conditions that are influencing yield losses are listed below.

(i) How well the crop growth cycle fits within the length of growing period

When the growing period is shorter than the growth cycle of the crop, from sowing to full maturity, there is loss of yield. The biomass and yield calculations account for direct losses by appropriately adjusting LAI and harvest index (see section 4.3.2). However, the loss in the marketable value of the produce due to poor quality of the yield as influenced by incomplete yield formation (e.g., incomplete grain filling in grain crops resulting in shriveled grains or yield of a lower grade, incomplete bulking in root and tuber leading to a poor grade of ware), is not accounted for in the biomass and yield calculations. This loss is to be considered as an agro-climatic constraint in addition to the quantitative yield loss due to curtailment of the yield formation period. Yield losses can also occur when the length of the growing period is much longer than the length of the growth cycles. These losses operate through yield and quality reducing effects of (i) pests, diseases and weeds, (ii) climatic factors affecting yield components and yield formation, and (iii) climatic conditions affecting the efficiency of farming operations.

(ii) The degree of water-stress during the growing period

Water-stress generally affects crop growth, yield formation and quality of produce. The yield reducing effects of water-stress varies from crop to crop. The total yield impact can be considered in terms of (i) the effect on growth of the whole crop, and (ii) the effect on yield formation and quality of produce. For some crops, the latter effect can be more severe than the former, particularly where the yield is a reproductive part (e.g., cereals) and yield formation depends on the sensitivity of floral parts and fruit set to water-stress (e.g., silk drying in maize).

(iii) Pests, diseases and weeds

To assess the agro-climatic constraints of pest, disease and weed complex, it is convenient to separate the effects on yields that operate through loss in crop growth potential (e.g., pest and diseases affecting vegetative parts in grain crops) from effects on yield that operate directly on yield formation and quality of produce (e.g., cotton stainer affecting lint quality, grain mould in sorghum affecting both yield and grain quality).

(iv) Climatic factors directly or indirectly reducing yield and quality of produce

These include problems of poor seed set and/or maturity under cool or low temperature conditions, problems of seed germination in the panicle due to wet conditions at the end of grain filling, problems of poor quality lint due to wet conditions during the time of boll opening period in cotton, problems of poor seed set in wet conditions at the time of flowering in some grain crops, and problems of excessive vegetative growth and poor harvest index due to high night-time temperature or low diurnal range in temperature.

(v) *Climatic factors affecting the efficiency of farming operations and costs of production*

Farming operations include those related to land preparation, sowing, cultivation and crop protection during crop growth, and harvesting (including operations related to handling the produce during harvest and the effectiveness of being able to dry the produce). Agro-climatic constraints in this category are essentially workability constraints, which primarily account for excessive wetness conditions. Limited workability can cause direct losses in yield and quality of produce, and/or impart a degree of relative unsuitability to an area for a given crop from the point of view of how effectively crop cultivation and produce handling can be conducted at a given level of inputs.

(vi) *Frost hazard and extreme temperature events*

The risk of occurrence of late and early frost increases substantially when mean temperatures drop below 10°C. Hence, length of the thermal growing period with temperatures above 10°C (LGPT10) in a grid-cell has been compared with growth cycle length of frost sensitive crops. When the crop growth cycle is slightly shorter than LGPT10 the constraints related to frost risk are adjudged moderate, when the growth cycle is very close or equal to LGPT10, the constraints have been adjudged as severe.

The agro-climatic constraints described above are closely related to prevailing climate conditions. For convenience they have been arranged in five groups as follows:

- (a) yield losses due to water-stress constraints on crop growth (e.g., rainfall variability);
- (b) yield losses due to the effect of pests, diseases and weed constraints on crop growth;
- (c) yield losses due to water stress, pest and diseases constraints on yield components and yield formation of produce (e.g., affecting quality of produce);
- (d) yield losses due to workability constraints (e.g., wetness rendering produce handling difficulties), and
- (e) yield losses due to occurrence of early or late frosts.

At the stage of computing potential biomass and yields, no account is taken of the effects of climatic conditions operating through pests and diseases, and workability. Such effects need to be included to arrive at realistic attainable crop yields. Precise estimates of their impacts are very difficult to obtain for a global study. Here it has been achieved by semi-quantifying the constraints in terms of reduction ratings, according to the different constraints and their severity for each crop, in each length of growing period zone and by level of inputs. The latter subdivision is necessary to take account of the fact that some constraints, such as bollworm on cotton, are present under low input conditions but are controllable under high input conditions in certain growing period zones. While some constraints are common to all input levels, others (e.g., poor workability through excess moisture) are more applicable to high input conditions with mechanized cultivation.

Although the constraints of group 'd' are not direct yield losses in reality, such constraints do mean, for example, that the high input level mechanized cultivator cannot get onto the land to carry out operations. In practice, these results in yield reductions. Similarly for the low input cultivator, for example, excessive wetness could mean that the produce is too wet to handle and remove, and again losses would be incurred even though the produce may be standing in the field. Also included in this group are constraints due to the cultivator having to use longer duration cultivars to enable harvesting in dry conditions. The use of such cultivars incurs yield restrictions, and such

circumstances under wet conditions have therefore been incorporated in the severity ratings of agro-climatic constraints in group 'd'.

In general, with increasing length of growing period and wetness, constraints due to pests and diseases (groups 'b' and 'c') become increasingly severe particularly to low input cultivators. As the length of growing period gets very long, even the high input level cultivator cannot keep these constraints under control and they become severe yield reducing factors at all three levels of inputs. Other factors, such as poor pod set in soybean or poor quality in short lengths of growing period zones, are of similar severity for all three levels of inputs. Difficulties in lifting root crops under dry soil conditions (short lengths of growing periods group 'd') are rated more severely under the high level of inputs (mechanized) than under intermediate and low level of inputs. For irrigated production the 'c' constraint is applied only at the wet end, i.e., above 300 days in the example of Table 9 (in Chapter 4).

Input level:

1 = low inputlevel, 2 = intermediate input level, 3 = high input level

Constraint type:

- 1 = 'a' constraint, yield losses due to water-stress constraints on crop growth (e.g., rainfall variability);
- 2 = 'b' constraint, yield losses due to the effect of pests, diseases and weed constraints on crop growth;
- 3 = 'c' constraint, yield losses due to water-stress, pest and diseases constraints on yield components and yield formation of produce;
- 4 = 'd' constraint, yield losses due to workability constraints (e.g., wetness rendering produce handling difficulties);
- 5 = 'e' constraint, yield losses due to occurrence of early or late frosts.

Crop	Growth cycle	Input levels	Con-strain t	Length of Growing Period														
				0	15	45	75	105	135	165	195	225	255	285	315	345	365-	365 +
WHEAT, TROPICS	100 days	1	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	100 days	1	2	0	0	0	0	0	0	0	0	0	25	25	25	25	25	25
	100 days	1	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
	100 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	100 days	2	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	100 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	25	25
	100 days	2	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
	100 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	100 days	3	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	100 days	3	2	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25
	100 days	3	3	25	25	25	25	25	0	0	0	0	0	0	0	25	25	50
	100 days	3	4	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	130 days	1	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	130 days	1	2	0	0	0	0	0	0	0	0	0	25	25	25	25	25	25
	130 days	1	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
	130 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	130 days	2	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	130 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	25	25
	130 days	2	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
	130 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	130 days	3	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	130 days	3	2	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25
	130 days	3	3	25	25	25	25	25	0	0	0	0	0	0	0	25	25	50
	130 days	3	4	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	160 days	1	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	160 days	1	2	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25
	160 days	1	3	25	25	25	25	25	0	0	0	0	0	0	0	25	25	50
	160 days	1	4	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	160 days	2	1	100	100	100	50	25	25	25	0	0	0	0	0	0	0	0
	160 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	25	25
	160 days	2	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
	160 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	160 days	3	1	100	100	100	50	25	25	25	0	0	0	0	0	0	0	0
	160 days	3	2	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25
	160 days	3	3	25	25	25	25	25	0	0	0	0	0	0	0	25	25	50
	160 days	3	4	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	190 days	1	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	190 days	1	2	0	0	0	0	0	0	0	0	0	0	0	0	25	25	25
	190 days	1	3	25	25	25	25	25	0	0	0	0	0	0	0	25	25	50
	190 days	1	4	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	190 days	2	1	100	100	100	50	25	25	25	0	0	0	0	0	0	0	0
	190 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	25	25
190 days	2	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50	
190 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50	
190 days	3	1	100	100	100	50	25	25	25	0	0	0	0	0	0	0	0	
190 days	3	2	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25	
190 days	3	3	25	25	25	25	25	0	0	0	0	0	0	0	25	25	50	
190 days	3	4	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50	

Crop	Growth cycle	Input levels	Constraint	Length of Growing Period															
				0	15	45	75	105	135	165	195	225	255	285	315	345	365+		
RICE, JAPONICA	150 days	1	1	100	100	100	100	100	100	100	50	50	50	25	25	25	25	25	
	150 days	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	
	150 days	1	3	50	50	50	50	50	50	25	25	0	0	0	25	25	25	25	
	150 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50	
	150 days	1	5	100	100	100	100	100	100	25	0	0	0	0	0	0	0	0	
	150 days	2	1	100	100	100	100	100	100	100	50	50	50	25	25	25	25	25	
	150 days	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	150 days	2	3	50	50	50	50	50	50	25	25	0	0	0	0	25	25	25	
	150 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50	
	150 days	2	5	100	100	100	100	100	100	25	0	0	0	0	0	0	0	0	
	150 days	3	1	100	100	100	100	100	100	100	50	50	50	25	25	25	25	25	
	150 days	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	150 days	3	3	50	50	50	50	50	50	25	25	0	0	0	0	0	25	25	
	150 days	3	4	0	0	0	0	0	0	0	0	0	0	0	25	25	25	50	
	150 days	3	5	100	100	100	100	100	100	25	0	0	0	0	0	0	0	0	
RICE, INDICA	105 days	1	1	100	100	100	100	100	100	100	50	50	50	25	25	25	25	25	
	105 days	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	
	105 days	1	3	50	50	50	50	50	50	25	25	0	0	0	25	25	25	25	
	105 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50	
	105 days	2	1	100	100	100	100	100	100	100	50	50	50	25	25	25	25	25	
	105 days	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	105 days	2	3	50	50	50	50	50	50	25	25	0	0	0	0	25	25	25	
	105 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50	
	105 days	3	1	100	100	100	100	100	100	100	50	50	50	25	25	25	25	25	
	105 days	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	105 days	3	3	50	50	50	50	50	50	25	25	0	0	0	0	0	25	25	
	105 days	3	4	0	0	0	0	0	0	0	0	0	0	0	25	25	25	50	
	120 days	1	1	100	100	100	100	100	100	100	100	50	50	50	25	25	25	25	25
	120 days	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
	120 days	1	3	50	50	50	50	50	50	25	25	0	0	0	25	25	25	25	25
	120 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50	50
	120 days	2	1	100	100	100	100	100	100	100	100	50	50	50	25	25	25	25	25
	120 days	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	120 days	2	3	50	50	50	50	50	50	25	25	0	0	0	0	25	25	25	25
	120 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50	50
	120 days	3	1	100	100	100	100	100	100	100	100	50	50	50	25	25	25	25	25
	120 days	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	120 days	3	3	50	50	50	50	50	50	25	25	0	0	0	0	0	25	25	25
	120 days	3	4	0	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	135 days	1	1	100	100	100	100	100	100	100	100	50	50	50	25	25	25	25	25
	135 days	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
	135 days	1	3	50	50	50	50	50	50	25	25	0	0	0	25	25	25	25	25
	135 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50	50
	135 days	2	1	100	100	100	100	100	100	100	100	50	50	50	25	25	25	25	25
	135 days	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
135 days	2	3	50	50	50	50	50	50	25	25	0	0	0	0	25	25	25	25	
135 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50	50	

Crop	Growth cycle	Input levels	Constrain t	Length of Growing Period														
				0	15	45	75	105	135	165	195	225	255	285	315	345	365-	365 +
RICE, INDICA	135 days	3	1	100	100	100	100	100	100	100	50	50	50	25	25	25	25	25
	135 days	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	135 days	3	3	50	50	50	50	50	50	25	25	0	0	0	0	0	25	25
	135 days	3	4	0	0	0	0	0	0	0	0	0	0	0	25	25	25	50
	150 days	1	1	100	100	100	100	100	100	100	50	50	50	25	25	25	25	25
	150 days	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
	150 days	1	3	50	50	50	50	50	50	25	25	0	0	0	25	25	25	25
	150 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	150 days	2	1	100	100	100	100	100	100	100	50	50	50	25	25	25	25	25
	150 days	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	150 days	2	3	50	50	50	50	50	50	25	25	0	0	0	0	25	25	25
	150 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	150 days	3	1	100	100	100	100	100	100	100	50	50	50	25	25	25	25	25
	150 days	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	150 days	3	3	50	50	50	50	50	50	25	25	0	0	0	0	0	25	25
	150 days	3	4	0	0	0	0	0	0	0	0	0	0	0	25	25	25	50
RICE, DRYLAND	105 days	1	1	100	100	100	50	50	50	50	25	25	0	0	0	0	0	0
	105 days	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
	105 days	1	3	50	50	50	50	50	50	25	25	0	0	0	25	25	25	25
	105 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	105 days	2	1	100	100	100	50	50	50	50	25	25	0	0	0	0	0	0
	105 days	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	105 days	2	3	50	50	50	50	50	50	25	25	0	0	0	0	25	25	25
	105 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	105 days	3	1	100	100	100	50	50	50	50	25	25	0	0	0	0	0	0
	105 days	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	105 days	3	3	50	50	50	50	50	50	25	25	0	0	0	0	0	25	25
	105 days	3	4	0	0	0	0	0	0	0	0	0	0	0	25	25	25	50
	120 days	1	1	100	100	100	50	50	50	50	25	25	0	0	0	0	0	0
	120 days	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
	120 days	1	3	50	50	50	50	50	50	25	25	0	0	0	25	25	25	25
	120 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	120 days	2	1	100	100	100	50	50	50	50	25	25	0	0	0	0	0	0
	120 days	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	120 days	2	3	50	50	50	50	50	50	25	25	0	0	0	0	25	25	25
	120 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	120 days	3	1	100	100	100	50	50	50	50	25	25	0	0	0	0	0	0
	120 days	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	120 days	3	3	50	50	50	50	50	50	25	25	0	0	0	0	0	25	25
	120 days	3	4	0	0	0	0	0	0	0	0	0	0	0	25	25	25	50
	135 days	1	1	100	100	100	50	50	50	50	25	25	0	0	0	0	0	0
	135 days	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
	135 days	1	3	50	50	50	50	50	50	25	25	0	0	0	25	25	25	25
	135 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	135 days	2	1	100	100	100	50	50	50	50	25	25	0	0	0	0	0	0
	135 days	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	135 days	2	3	50	50	50	50	50	50	25	25	0	0	0	0	25	25	25
	135 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50

Crop	Growth cycle	Input levels	Con-strain t	Length of Growing Period														
				0	15	45	75	105	135	165	195	225	255	285	315	345	365- +	
RICE, DRYLAND	135 days	3	1	100	100	100	50	50	50	50	25	25	0	0	0	0	0	0
	135 days	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	135 days	3	3	50	50	50	50	50	50	25	25	0	0	0	0	0	25	25
	135 days	3	4	0	0	0	0	0	0	0	0	0	0	0	25	25	25	50
MAIZE (GRAIN), TROPICAL LOWLAND	90 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	90 days	1	2	25	25	25	25	25	25	0	0	25	25	25	25	25	25	50
	90 days	1	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50	
	90 days	1	4	0	0	0	0	0	0	0	0	25	25	25	50	50	50	
	90 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	90 days	2	2	0	0	0	0	0	0	0	0	25	25	25	25	25	50	
	90 days	2	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50	
	90 days	2	4	0	0	0	0	0	0	0	25	50	50	50	50	50	50	
	90 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	90 days	3	2	0	0	0	0	0	0	0	0	25	25	25	25	25	50	
	90 days	3	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50	
	90 days	3	4	0	0	0	0	0	0	0	25	50	50	50	50	50	50	
	105 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	105 days	1	2	25	25	25	25	25	25	0	0	25	25	25	25	25	25	50
	105 days	1	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50	
	105 days	1	4	0	0	0	0	0	0	0	0	25	25	25	50	50	50	
	105 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	105 days	2	2	0	0	0	0	0	0	0	0	25	25	25	25	25	50	
	105 days	2	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50	
	105 days	2	4	0	0	0	0	0	0	0	25	50	50	50	50	50	50	
	105 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	105 days	3	2	0	0	0	0	0	0	0	0	25	25	25	25	25	50	
	105 days	3	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50	
	105 days	3	4	0	0	0	0	0	0	0	25	50	50	50	50	50	50	
	120 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	120 days	1	2	25	25	25	25	25	25	0	0	25	25	25	25	25	25	50
	120 days	1	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50	
	120 days	1	4	0	0	0	0	0	0	0	0	25	25	25	50	50	50	
	120 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	120 days	2	2	0	0	0	0	0	0	0	0	25	25	25	25	25	50	
	120 days	2	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50	
	120 days	2	4	0	0	0	0	0	0	0	25	50	50	50	50	50	50	
	120 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	120 days	3	2	0	0	0	0	0	0	0	0	25	25	25	25	25	50	
	120 days	3	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50	
	120 days	3	4	0	0	0	0	0	0	0	25	50	50	50	50	50	50	
	135 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	135 days	1	2	25	25	25	25	25	25	0	0	25	25	25	25	25	25	50
	135 days	1	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50	
	135 days	1	4	0	0	0	0	0	0	0	0	25	25	25	50	25	50	
135 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0	
135 days	2	2	0	0	0	0	0	0	0	0	25	25	25	25	25	50		
135 days	2	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50		
135 days	2	4	0	0	0	0	0	0	0	25	50	50	50	50	50	50		

Crop	Growth cycle	Input levels	Constraint	Length of Growing Period														
				0	15	45	75	105	135	165	195	225	255	285	315	345	365+	
MAIZE (GRAIN), TROPICAL LOWLAND	135 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	135 days	3	2	0	0	0	0	0	0	0	0	0	25	25	25	25	25	50
	135 days	3	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50	
	135 days	3	4	0	0	0	0	0	0	0	25	50	50	50	50	50	50	
MAIZE (GRAIN), TROPICAL HIGHLAND	105 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	
	105 days	1	2	25	25	25	25	25	25	0	0	25	25	25	25	25	50	
	105 days	1	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50	
	105 days	1	4	0	0	0	0	0	0	0	0	25	25	25	50	50	50	
	105 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	
	105 days	2	2	0	0	0	0	0	0	0	0	25	25	25	25	25	50	
	105 days	2	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50	
	105 days	2	4	0	0	0	0	0	0	0	25	50	50	50	50	50	50	
	105 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	
	105 days	3	2	0	0	0	0	0	0	0	0	25	25	25	25	25	50	
	105 days	3	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50	
	105 days	3	4	0	0	0	0	0	0	0	25	50	50	50	50	50	50	
	180 days	1	1	100	100	100	50	50	50	25	25	0	0	0	0	0	0	
	180 days	1	2	25	25	25	25	25	25	0	0	0	0	25	25	25	25	50
	180 days	1	3	50	50	50	50	50	50	25	0	0	0	0	0	25	25	50
	180 days	1	4	0	0	0	0	0	0	0	0	0	0	25	50	50	50	
	180 days	2	1	100	100	100	50	50	50	25	25	0	0	0	0	0	0	
	180 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50	
	180 days	2	3	50	50	50	50	50	50	25	0	0	0	0	0	25	25	50
	180 days	2	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50	
	180 days	3	1	100	100	100	50	50	50	25	25	0	0	0	0	0	0	
	180 days	3	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50	
	180 days	3	3	50	50	50	50	50	50	25	0	0	0	0	0	25	25	50
	180 days	3	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50	
	300 days	1	1	100	100	100	50	50	50	50	50	50	50	25	0	0	0	
	300 days	1	2	25	25	25	25	25	25	0	0	0	0	25	25	25	25	50
	300 days	1	3	50	50	50	50	50	50	50	50	25	25	0	0	25	25	50
	300 days	1	4	0	0	0	0	0	0	0	0	0	0	25	50	50	50	
	300 days	2	1	100	100	100	50	50	50	50	50	50	50	25	0	0	0	
	300 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50	
	300 days	2	3	50	50	50	50	50	50	50	50	25	25	0	0	25	25	50
	300 days	2	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	
300 days	3	1	100	100	100	50	50	50	50	50	50	50	25	0	0	0		
300 days	3	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50		
300 days	3	3	50	50	50	50	50	50	50	50	25	25	0	0	25	25	50	
300 days	3	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50		
MAIZE (GRAIN), SUBTROP./TEMPER.	105 days	1	1	100	100	100	50	25	0	0	0	0	0	0	0	0	0	
	105 days	1	2	0	0	0	0	0	0	0	25	25	25	25	25	25	50	
	105 days	1	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50	
	105 days	1	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	
	105 days	1	5	100	100	100	100	25	0	0	0	0	0	0	0	0	0	
	105 days	2	1	100	100	100	50	25	0	0	0	0	0	0	0	0	0	
	105 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50	
	105 days	2	3	50	50	50	50	25	0	0	0	0	0	0	25	25	50	

Crop	Growth cycle	Input levels	Constraint	Length of Growing Period														
				0	15	45	75	105	135	165	195	225	255	285	315	345	365-	365+
BARLEY, SUB-TROPICS	120 days	1	1	100	100	100	50	25	25	25	0	0	0	0	0	0	0	0
	120 days	1	2	0	0	0	0	0	0	0	0	0	25	25	25	25	25	25
	120 days	1	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
	120 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	120 days	1	5	100	100	100	100	50	25	0	0	0	0	0	0	0	0	0
	120 days	2	1	100	100	100	50	25	25	25	0	0	0	0	0	0	0	0
	120 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	25	25
	120 days	2	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
	120 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	120 days	2	5	100	100	100	100	50	25	0	0	0	0	0	0	0	0	0
	120 days	3	1	100	100	100	50	25	25	25	0	0	0	0	0	0	0	0
	120 days	3	2	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25
	120 days	3	3	25	25	25	25	25	0	0	0	0	0	0	0	25	25	50
	120 days	3	4	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	120 days	3	5	100	100	100	100	50	25	0	0	0	0	0	0	0	0	0
	135 days	1	1	100	100	100	50	25	25	25	0	0	0	0	0	0	0	0
	135 days	1	2	0	0	0	0	0	0	0	0	0	25	25	25	25	25	25
	135 days	1	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
	135 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	135 days	1	5	100	100	100	100	100	25	0	0	0	0	0	0	0	0	0
	135 days	2	1	100	100	100	50	25	25	25	0	0	0	0	0	0	0	0
	135 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	25	25
	135 days	2	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
	135 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	135 days	2	5	100	100	100	100	100	25	0	0	0	0	0	0	0	0	0
	135 days	3	1	100	100	100	50	25	25	25	0	0	0	0	0	0	0	0
	135 days	3	2	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25
	135 days	3	3	25	25	25	25	25	0	0	0	0	0	0	0	25	25	50
	135 days	3	4	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	135 days	3	5	100	100	100	100	100	25	0	0	0	0	0	0	0	0	0
BARLEY, TROPICS	100 days	1	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	
	100 days	1	2	0	0	0	0	0	0	0	0	0	25	25	25	25	25	25
	100 days	1	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
	100 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	100 days	2	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	100 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	25	25
	100 days	2	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
	100 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	100 days	3	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	100 days	3	2	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25
	100 days	3	3	25	25	25	25	25	0	0	0	0	0	0	0	25	25	50
	100 days	3	4	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50

Crop	Growth cycle	Input levels	Constraint	Length of Growing Period														
				0	15	45	75	105	135	165	195	225	255	285	315	345	365+	
BARLEY, TROPICS	130 days	1	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	130 days	1	2	0	0	0	0	0	0	0	0	0	0	25	25	25	25	25
	130 days	1	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
	130 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	130 days	2	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	130 days	2	2	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25
	130 days	2	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
	130 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	130 days	3	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	130 days	3	2	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25
	130 days	3	3	25	25	25	25	25	0	0	0	0	0	0	0	25	25	50
	130 days	3	4	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	160 days	1	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	160 days	1	2	0	0	0	0	0	0	0	0	0	0	0	0	25	25	25
	160 days	1	3	25	25	25	25	25	0	0	0	0	0	0	0	25	25	50
	160 days	1	4	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	160 days	2	1	100	100	100	50	25	25	25	0	0	0	0	0	0	0	0
	160 days	2	2	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25
	160 days	2	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
	160 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	160 days	3	1	100	100	100	50	25	25	25	0	0	0	0	0	0	0	0
	160 days	3	2	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25
	160 days	3	3	25	25	25	25	25	0	0	0	0	0	0	0	25	25	50
	160 days	3	4	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	190 days	1	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	190 days	1	2	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25
	190 days	1	3	25	25	25	25	25	0	0	0	0	0	0	0	25	25	50
	190 days	1	4	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	190 days	2	1	100	100	100	50	25	25	25	0	0	0	0	0	0	0	0
	190 days	2	2	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25
190 days	2	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50	
190 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50	
190 days	3	1	100	100	100	50	25	25	25	0	0	0	0	0	0	0	0	
190 days	3	2	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25	
190 days	3	3	25	25	25	25	25	0	0	0	0	0	0	0	25	25	50	
190 days	3	4	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50	
SORGHUM, LOWLAND	90 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	
	90 days	1	2	25	25	25	25	25	25	0	0	25	25	50	50	50	50	
	90 days	1	3	25	25	25	25	0	0	0	0	25	50	50	50	50	50	
	90 days	1	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50	
	90 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	
	90 days	2	2	0	0	0	0	0	0	0	0	0	0	25	50	50	50	
	90 days	2	3	25	25	25	25	0	0	0	0	25	50	50	50	50	50	
	90 days	2	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50	
	90 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	
	90 days	3	2	0	0	0	0	0	0	0	0	0	0	25	50	50	50	
	90 days	3	3	25	25	25	25	0	0	0	0	25	50	50	50	50	50	
90 days	3	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50		

Crop	Growth cycle	Input levels	Constraint	Length of Growing Period													
				0	15	45	75	105	135	165	195	225	255	285	315	345	365+
SORGHUM, LOWLAND	105 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	105 days	1	2	25	25	25	25	25	25	0	0	25	25	50	50	50	50
	105 days	1	3	25	25	25	25	0	0	0	0	25	50	50	50	50	50
	105 days	1	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	105 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	105 days	2	2	0	0	0	0	0	0	0	0	0	0	25	50	50	50
	105 days	2	3	25	25	25	25	0	0	0	0	25	50	50	50	50	50
	105 days	2	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	105 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	105 days	3	2	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	105 days	3	3	25	25	25	25	0	0	0	0	25	50	50	50	50	50
	105 days	3	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	120 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	120 days	1	2	25	25	25	25	25	25	0	0	25	25	50	50	50	50
	120 days	1	3	25	25	25	25	0	0	0	0	25	50	50	50	50	50
	120 days	1	4	0	0	0	0	0	0	0	0	25	25	25	50	50	50
	120 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	120 days	2	2	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	120 days	2	3	25	25	25	25	0	0	0	0	25	50	50	50	50	50
	120 days	2	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	120 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	120 days	3	2	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	120 days	3	3	25	25	25	25	0	0	0	0	25	50	50	50	50	50
	120 days	3	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	135 days	1	1	100	100	100	100	50	25	0	0	0	0	0	0	0	0
	135 days	1	2	25	25	25	25	25	25	0	0	25	25	50	50	50	50
	135 days	1	3	25	25	25	25	0	0	0	0	25	50	50	50	50	50
	135 days	1	4	0	0	0	0	0	0	0	0	25	25	25	50	50	50
	135 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	135 days	2	2	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	135 days	2	3	25	25	25	25	0	0	0	0	25	50	50	50	50	50
	135 days	2	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	135 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	135 days	3	2	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	135 days	3	3	25	25	25	25	0	0	0	0	25	50	50	50	50	50
	135 days	3	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50
SORGHUM, HIGHLAND	105 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	
	105 days	1	2	25	25	25	25	25	25	0	0	25	25	50	50	50	50
	105 days	1	3	50	50	50	25	0	0	0	25	50	50	50	50	50	
	105 days	1	4	0	0	0	0	0	0	0	0	25	25	25	50	50	
	105 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	
	105 days	2	2	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	105 days	2	3	50	50	50	25	0	0	0	25	50	50	50	50	50	50
	105 days	2	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	105 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	105 days	3	2	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	105 days	3	3	50	50	50	25	0	0	0	25	50	50	50	50	50	50
	105 days	3	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50

Crop	Growth cycle	Input levels	Con-strain t	Length of Growing Period														
				0	15	45	75	105	135	165	195	225	255	285	315	345	365-	365 +
SORGHUM, HIGHLAND	180 days	1	1	100	100	100	50	50	50	25	25	0	0	0	0	0	0	0
	180 days	1	2	25	25	25	25	25	25	0	0	0	25	25	50	50	50	50
	180 days	1	3	50	50	50	50	50	50	25	0	0	0	25	50	50	50	50
	180 days	1	4	0	0	0	0	0	0	0	0	0	0	25	25	50	50	50
	180 days	2	1	100	100	100	50	50	50	25	25	0	0	0	0	0	0	0
	180 days	2	2	0	0	0	0	0	0	0	0	0	0	0	25	50	50	50
	180 days	2	3	50	50	50	50	50	50	25	0	0	0	25	50	50	50	50
	180 days	2	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	180 days	3	1	100	100	100	50	50	50	25	25	0	0	0	0	0	0	0
	180 days	3	2	0	0	0	0	0	0	0	0	0	0	0	25	50	50	50
	180 days	3	3	50	50	50	50	50	50	25	0	0	0	25	50	50	50	50
	180 days	3	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	300 days	1	1	100	100	100	50	50	50	50	50	50	50	25	0	0	0	0
	300 days	1	2	25	25	25	25	25	25	0	0	0	0	0	25	50	50	50
	300 days	1	3	50	50	50	50	50	50	50	50	50	25	25	25	50	50	50
	300 days	1	4	0	0	0	0	0	0	0	0	0	0	0	25	50	50	50
	300 days	2	1	100	100	100	50	50	50	50	50	50	50	25	0	0	0	0
	300 days	2	2	0	0	0	0	0	0	0	0	0	0	0	25	50	50	50
	300 days	2	3	50	50	50	50	50	50	50	50	50	25	25	25	50	50	50
	300 days	2	4	0	0	0	0	0	0	0	0	0	0	25	50	50	50	50
300 days	3	1	100	100	100	50	50	50	50	50	50	50	25	0	0	0	0	
300 days	3	2	0	0	0	0	0	0	0	0	0	0	0	25	50	50	50	
300 days	3	3	50	50	50	50	50	50	50	50	50	25	25	25	50	50	50	
300 days	3	4	0	0	0	0	0	0	0	0	0	0	25	50	50	50	50	
WINTER RYE	30+90 d	1	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	30+90 d	1	2	0	0	0	0	0	0	0	0	0	25	25	25	25	25	25
	30+90 d	1	3	25	25	25	25	25	25	0	0	0	0	0	25	25	50	50
	30+90 d	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	30+90 d	1	5	100	100	100	100	25	0	0	0	0	0	0	0	0	0	0
	30+90 d	2	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	30+90 d	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	25	25
	30+90 d	2	3	25	25	25	25	25	25	0	0	0	0	0	25	25	50	50
	30+90 d	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	30+90 d	2	5	100	100	100	100	25	0	0	0	0	0	0	0	0	0	0
	30+90 d	3	1	100	100	100	50	25	25	0	0	0	0	0	0	0	0	0
	30+90 d	3	2	0	0	0	0	0	0	0	0	0	0	0	25	25	25	25
	30+90 d	3	3	25	25	25	25	25	0	0	0	0	0	0	0	25	25	50
	30+90 d	3	4	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	30+90 d	3	5	100	100	100	100	25	0	0	0	0	0	0	0	0	0	0
	35+105 d	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	35+105 d	1	2	0	0	0	0	0	0	0	0	0	25	25	25	25	25	25
	35+105 d	1	3	25	25	25	25	25	25	0	0	0	0	0	25	25	50	50
	35+105 d	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	35+105 d	1	5	100	100	100	100	50	0	0	0	0	0	0	0	0	0	0
35+105 d	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0	
35+105 d	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	25	25	
35+105 d	2	3	25	25	25	25	25	25	0	0	0	0	0	25	25	50	50	

Crop	Growth cycle	Input levels	Constraint	Length of Growing Period														
				0	15	45	75	105	135	165	195	225	255	285	315	345	365-	365+
WHITE POTATO	180 days	1	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	180 days	1	2	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50
	180 days	1	3	50	50	50	50	50	25	25	0	0	0	25	50	50	50	50
	180 days	1	4	0	0	0	0	0	25	0	0	0	0	25	25	50	50	50
	180 days	1	5	100	100	100	100	100	100	50	25	0	0	0	0	0	0	0
	180 days	2	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	180 days	2	2	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50
	180 days	2	3	50	50	50	50	50	25	25	0	0	0	25	25	50	50	50
	180 days	2	4	0	0	0	0	0	25	0	0	0	25	50	50	50	50	50
	180 days	2	5	100	100	100	100	100	100	50	25	0	0	0	0	0	0	0
	180 days	3	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	180 days	3	2	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50
	180 days	3	3	50	50	50	50	50	25	25	0	0	0	25	25	50	50	50
	180 days	3	4	0	0	0	0	0	25	0	0	0	25	50	50	50	50	50
	180 days	3	5	100	100	100	100	100	100	50	25	0	0	0	0	0	0	0
CASSAVA	<= 365 d	1	1	100	100	100	50	50	25	25	0	0	0	0	0	0	0	0
	<= 365 d	1	2	25	25	0	0	0	0	25	25	25	25	25	25	25	25	25
	<= 365 d	1	3	25	25	25	25	25	25	0	0	0	0	0	25	25	25	25
	<= 365 d	1	4	0	0	0	0	0	25	0	0	0	0	0	0	25	25	25
	<= 365 d	2	1	100	100	100	50	50	25	25	0	0	0	0	0	0	0	0
	<= 365 d	2	2	25	25	0	0	0	0	0	0	0	0	0	0	0	0	0
	<= 365 d	2	3	25	25	25	25	25	25	0	0	0	0	0	25	25	25	25
	<= 365 d	2	4	0	0	0	0	0	25	0	0	0	0	0	25	50	50	50
	<= 365 d	3	1	100	100	100	50	50	25	25	0	0	0	0	0	0	0	0
	<= 365 d	3	2	25	25	0	0	0	0	0	0	0	0	0	0	0	0	0
	<= 365 d	3	3	25	25	25	25	25	25	0	0	0	0	0	25	25	25	25
<= 365 d	3	4	0	0	0	0	0	25	0	0	0	0	0	25	50	50	50	
SWEET POTATO	150 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	150 days	1	2	25	25	25	25	0	0	0	0	0	0	0	0	0	0	0
	150 days	1	3	25	25	25	25	25	0	0	0	25	25	50	50	50	50	
	150 days	1	4	0	0	0	0	0	25	0	0	0	0	0	0	25	50	50
	150 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	150 days	2	2	25	25	25	25	0	0	0	0	0	0	0	0	0	0	0
	150 days	2	3	25	25	25	25	25	0	0	0	0	0	25	25	50	50	50
	150 days	2	4	0	0	0	0	0	25	0	0	0	0	0	25	25	50	50
	150 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	150 days	3	2	25	25	25	25	0	0	0	0	0	0	0	0	0	0	0
	150 days	3	3	25	25	25	25	25	0	0	0	0	0	25	25	50	50	50
	150 days	3	4	0	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	180 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	180 days	1	2	25	25	25	25	0	0	0	0	0	0	0	0	0	0	0
	180 days	1	3	25	25	25	25	25	0	0	0	25	25	50	50	50	50	50
	180 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	50	50
	180 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	180 days	2	2	25	25	25	25	0	0	0	0	0	0	0	0	0	0	0
	180 days	2	3	25	25	25	25	25	0	0	0	0	0	25	25	50	50	50
180 days	2	4	0	0	0	0	0	0	0	0	0	0	0	25	25	50	50	

Crop	Growth cycle	Input levels	Constrain t	Length of Growing Period														
				0	15	45	75	105	135	165	195	225	255	285	315	345	365-	365 +
SWEET POTATO	180 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	180 days	3	2	25	25	25	25	0	0	0	0	0	0	0	0	0	0	0
	180 days	3	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
	180 days	3	4	0	0	0	0	0	0	0	0	0	0	0	25	50	50	50
	210 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	210 days	1	2	25	25	25	25	0	0	0	0	0	0	0	0	0	0	0
	210 days	1	3	25	25	25	25	25	0	0	0	0	25	25	50	50	50	50
	210 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	25	50
	210 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	210 days	2	2	25	25	25	25	0	0	0	0	0	0	0	0	0	0	0
	210 days	2	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
	210 days	2	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	210 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	210 days	3	2	25	25	25	25	0	0	0	0	0	0	0	0	0	0	0
	210 days	3	3	25	25	25	25	25	0	0	0	0	0	0	25	25	50	50
210 days	3	4	0	0	0	0	0	0	0	0	0	0	0	25	50	50	50	
SUGAR-CANE	<= 365 d	1	1	100	100	100	100	50	50	50	25	0	0	0	0	0	0	
	<= 365 d	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	<= 365 d	1	3	0	0	0	0	25	25	0	0	0	0	0	0	0	25	
	<= 365 d	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	<= 365 d	2	1	100	100	100	100	50	50	50	25	0	0	0	0	0	0	
	<= 365 d	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	<= 365 d	2	3	0	0	0	0	25	25	0	0	0	0	0	0	0	25	
	<= 365 d	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	<= 365 d	3	1	100	100	100	100	50	50	50	25	0	0	0	0	0	0	
	<= 365 d	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	<= 365 d	3	3	0	0	0	0	25	25	0	0	0	0	0	0	0	25	
<= 365 d	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
SUGAR-BEET	150 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	
	150 days	1	2	0	0	0	0	0	0	0	0	25	25	50	50	50	50	
	150 days	1	3	25	25	25	25	25	0	0	0	0	25	25	50	50	50	
	150 days	1	4	0	0	0	0	0	25	0	0	0	0	0	25	50	50	
	150 days	1	5	100	100	100	100	100	50	0	0	0	0	0	0	0	0	
	150 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	
	150 days	2	2	0	0	0	0	0	0	0	0	0	25	25	50	50	50	
	150 days	2	3	25	25	25	25	25	0	0	0	0	0	25	50	50	50	
	150 days	2	4	0	0	0	0	0	25	0	0	0	0	25	25	50	50	
	150 days	2	5	100	100	100	100	100	50	0	0	0	0	0	0	0	0	
	150 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	
	150 days	3	2	0	0	0	0	0	0	0	0	0	25	25	50	50	50	
	150 days	3	3	25	25	25	25	25	0	0	0	0	0	25	50	50	50	
	150 days	3	4	0	0	0	0	0	25	0	0	0	25	25	50	50	50	
	150 days	3	5	100	100	100	100	100	50	0	0	0	0	0	0	0	0	
	165 days	1	1	100	100	100	50	50	50	0	0	0	0	0	0	0	0	
	165 days	1	2	0	0	0	0	0	0	0	0	0	25	25	50	50	50	
	165 days	1	3	25	25	25	25	25	0	0	0	0	0	25	25	50	50	
	165 days	1	4	0	0	0	0	0	0	0	0	0	0	0	25	50	50	
165 days	1	5	100	100	100	100	100	50	25	0	0	0	0	0	0	0		

Crop	Growth cycle	Input levels	Con-strain t	Length of Growing Period													
				0	15	45	75	105	135	165	195	225	255	285	315	345	365- +
SUGAR-BEET	165 days	2	1	100	100	100	50	50	50	0	0	0	0	0	0	0	0
	165 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	50	50
	165 days	2	3	25	25	25	25	25	0	0	0	0	0	0	25	50	50
	165 days	2	4	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	165 days	2	5	100	100	100	100	100	50	25	0	0	0	0	0	0	0
	165 days	3	1	100	100	100	50	50	50	0	0	0	0	0	0	0	0
	165 days	3	2	0	0	0	0	0	0	0	0	0	0	25	25	50	50
	165 days	3	3	25	25	25	25	25	0	0	0	0	0	0	25	50	50
	165 days	3	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	165 days	3	5	100	100	100	100	100	50	25	0	0	0	0	0	0	0
	180 days	1	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0
	180 days	1	2	0	0	0	0	0	0	0	0	0	25	25	50	50	50
	180 days	1	3	25	25	25	25	25	0	0	0	0	0	25	25	50	50
	180 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	50
	180 days	1	5	100	100	100	100	100	100	50	0	0	0	0	0	0	0
	180 days	2	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0
	180 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	50	50
	180 days	2	3	25	25	25	25	25	0	0	0	0	0	0	25	50	50
	180 days	2	4	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	180 days	2	5	100	100	100	100	100	100	50	0	0	0	0	0	0	0
	180 days	3	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0
	180 days	3	2	0	0	0	0	0	0	0	0	0	0	25	25	50	50
	180 days	3	3	25	25	25	25	25	0	0	0	0	0	0	25	50	50
	180 days	3	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	180 days	3	5	100	100	100	100	100	100	50	0	0	0	0	0	0	0
	195 days	1	1	100	100	100	50	50	50	50	0	0	0	0	0	0	0
	195 days	1	2	0	0	0	0	0	0	0	0	0	25	25	50	50	50
	195 days	1	3	25	25	25	25	25	0	0	0	0	0	25	25	50	50
	195 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	50
	195 days	1	5	100	100	100	100	100	100	100	25	0	0	0	0	0	0
	195 days	2	1	100	100	100	50	50	50	50	0	0	0	0	0	0	0
	195 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	50	50
	195 days	2	3	25	25	25	25	25	0	0	0	0	0	0	25	50	50
	195 days	2	4	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	195 days	2	5	100	100	100	100	100	100	100	25	0	0	0	0	0	0
	195 days	3	1	100	100	100	50	50	50	50	0	0	0	0	0	0	0
	195 days	3	2	0	0	0	0	0	0	0	0	0	0	25	25	50	50
	195 days	3	3	25	25	25	25	25	0	0	0	0	0	0	25	50	50
	195 days	3	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	195 days	3	5	100	100	100	100	100	100	100	25	0	0	0	0	0	0
	210 days	1	1	100	100	100	50	50	50	50	0	0	0	0	0	0	0
	210 days	1	2	0	0	0	0	0	0	0	0	0	25	25	50	50	50
210 days	1	3	25	25	25	25	25	0	0	0	0	0	25	25	50	50	
210 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	50	
210 days	1	5	100	100	100	100	100	100	100	50	0	0	0	0	0	0	

Crop	Growth cycle	Input levels	Constraint	Length of Growing Period													
				0	15	45	75	105	135	165	195	225	255	285	315	345	365+
SUGAR-BEET	210 days	2	1	100	100	100	50	50	50	50	25	0	0	0	0	0	0
	210 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	50	50
	210 days	2	3	25	25	25	25	25	0	0	0	0	0	0	25	50	50
	210 days	2	4	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	210 days	2	5	100	100	100	100	100	100	100	50	0	0	0	0	0	0
	210 days	3	1	100	100	100	50	50	50	50	25	0	0	0	0	0	0
	210 days	3	2	0	0	0	0	0	0	0	0	0	0	25	25	50	50
	210 days	3	3	25	25	25	25	25	0	0	0	0	0	0	25	50	50
	210 days	3	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	210 days	3	5	100	100	100	100	100	100	100	50	0	0	0	0	0	0
PHASEOL. BEAN, LOWLAND	90 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	90 days	1	2	0	0	0	0	0	0	0	25	25	50	50	50	50	50
	90 days	1	3	50	50	50	50	25	0	0	0	25	25	25	25	50	50
	90 days	1	4	0	0	0	0	0	0	0	0	0	0	25	25	50	50
	90 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	90 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50
	90 days	2	3	50	50	50	50	25	0	0	0	0	0	0	25	50	50
	90 days	2	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	90 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	90 days	3	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50
	90 days	3	3	50	50	50	50	25	0	0	0	0	0	0	25	50	50
	90 days	3	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	120 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	120 days	1	2	0	0	0	0	0	0	0	25	25	50	50	50	50	50
	120 days	1	3	50	50	50	50	25	0	0	0	25	25	25	25	50	50
	120 days	1	4	0	0	0	0	0	0	0	0	0	0	25	25	50	50
	120 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	120 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50
	120 days	2	3	50	50	50	50	25	0	0	0	0	0	0	25	50	50
	120 days	2	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	120 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	120 days	3	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50
	120 days	3	3	50	50	50	50	25	0	0	0	0	0	0	25	50	50
	120 days	3	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	150 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	150 days	1	2	0	0	0	0	0	0	0	25	25	50	50	50	50	50
	150 days	1	3	50	50	50	50	25	0	0	0	25	25	25	25	50	50
	150 days	1	4	0	0	0	0	0	0	0	0	0	0	25	25	50	50
	150 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0
	150 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50
150 days	2	3	50	50	50	50	25	0	0	0	0	0	0	25	50	50	
150 days	2	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50	
150 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	
150 days	3	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50	
150 days	3	3	50	50	50	50	25	0	0	0	0	0	0	25	50	50	
150 days	3	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50	

Crop	Growth cycle	Input levels	Constraint	Length of Growing Period														
				0	15	45	75	105	135	165	195	225	255	285	315	345	365+	
CHICKPEA (CR)	150 days	3	1	100	100	100	100	50	0	0	0	0	0	0	0	0	0	0
	150 days	3	2	0	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	150 days	3	3	25	25	25	25	0	0	0	0	0	0	0	50	50	50	50
	150 days	3	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50
	150 days	3	5	100	100	100	100	100	50	0	0	0	0	0	0	0	0	0
	180 days	1	1	100	100	100	100	100	50	0	0	0	0	0	0	0	0	0
	180 days	1	2	25	25	25	25	25	0	0	0	0	25	50	50	50	50	50
	180 days	1	3	50	50	50	25	25	25	0	0	0	25	50	50	50	50	50
	180 days	1	4	0	0	0	0	0	0	0	0	0	0	25	25	50	50	50
	180 days	1	5	100	100	100	100	100	50	25	0	0	0	0	0	0	0	0
	180 days	2	1	100	100	100	100	50	0	0	0	0	0	0	0	0	0	0
	180 days	2	2	0	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	180 days	2	3	25	25	25	25	25	0	0	0	0	0	25	50	50	50	50
	180 days	2	4	0	0	0	0	0	0	0	0	0	0	25	25	50	50	50
	180 days	2	5	100	100	100	100	100	50	25	0	0	0	0	0	0	0	0
	180 days	3	1	100	100	100	100	50	0	0	0	0	0	0	0	0	0	0
	180 days	3	2	0	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	180 days	3	3	25	25	25	25	0	0	0	0	0	0	0	50	50	50	50
	180 days	3	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50
	180 days	3	5	100	100	100	100	100	50	25	0	0	0	0	0	0	0	0
COWPEA	80 days	1	1	100	100	100	50	25	0	0	0	0	0	0	0	0	0	0
	80 days	1	2	25	25	0	0	0	0	0	0	25	25	25	25	25	50	50
	80 days	1	3	50	50	50	50	25	25	0	0	0	25	25	25	25	50	50
	80 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	80 days	2	1	100	100	100	50	25	0	0	0	0	0	0	0	0	0	0
	80 days	2	2	25	25	0	0	0	0	0	0	0	25	25	25	25	25	50
	80 days	2	3	50	50	50	50	25	25	0	0	0	0	0	0	25	50	50
	80 days	2	4	0	0	0	0	0	0	0	0	0	0	0	25	50	50	50
	80 days	3	1	100	100	100	50	25	0	0	0	0	0	0	0	0	0	0
	80 days	3	2	25	25	0	0	0	0	0	0	0	0	0	25	25	25	50
	80 days	3	3	50	50	50	50	25	25	0	0	0	0	0	0	25	50	50
	80 days	3	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50	50
	100 days	1	1	100	100	100	50	50	0	0	0	0	0	0	0	0	0	0
	100 days	1	2	25	25	0	0	0	0	0	0	25	25	25	25	25	50	50
	100 days	1	3	50	50	50	50	25	25	0	0	0	25	25	25	25	50	50
	100 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50
	100 days	2	1	100	100	100	50	50	0	0	0	0	0	0	0	0	0	0
	100 days	2	2	25	25	0	0	0	0	0	0	0	25	25	25	25	25	50
	100 days	2	3	50	50	50	50	25	25	0	0	0	0	0	0	25	50	50
	100 days	2	4	0	0	0	0	0	0	0	0	0	0	0	25	50	50	50
	100 days	3	1	100	100	100	50	50	0	0	0	0	0	0	0	0	0	0
	100 days	3	2	25	25	0	0	0	0	0	0	0	0	0	25	25	25	50
	100 days	3	3	50	50	50	50	25	25	0	0	0	0	0	0	25	50	50
	100 days	3	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50	50
	120 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	120 days	1	2	25	25	0	0	0	0	0	0	25	25	25	25	25	50	50
	120 days	1	3	50	50	50	50	25	25	0	0	0	25	25	25	25	50	50
	120 days	1	4	0	0	0	0	0	0	0	0	0	0	0	0	25	25	50

Crop	Growth cycle	Input levels	Constraint	Length of Growing Period														
				0	15	45	75	105	135	165	195	225	255	285	315	345	365+	
COWPEA	120 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	120 days	2	2	25	25	0	0	0	0	0	0	0	25	25	25	25	25	50
	120 days	2	3	50	50	50	50	25	25	0	0	0	0	0	25	50	50	50
	120 days	2	4	0	0	0	0	0	0	0	0	0	0	0	25	50	50	50
	120 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	120 days	3	2	25	25	0	0	0	0	0	0	0	0	0	25	25	25	50
	120 days	3	3	50	50	50	50	25	25	0	0	0	0	0	0	25	50	50
	120 days	3	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50	50
GROUND-NUT	90 days	1	1	100	100	100	50	50	0	0	0	0	0	0	0	0	0	0
	90 days	1	2	0	0	0	0	0	0	0	0	25	25	25	25	50	50	50
	90 days	1	3	50	50	50	50	25	25	0	0	0	25	25	25	25	50	50
	90 days	1	4	0	0	0	0	0	0	0	0	0	0	0	25	25	25	50
	90 days	2	1	100	100	100	50	50	0	0	0	0	0	0	0	0	0	0
	90 days	2	2	0	0	0	0	0	0	0	0	0	25	25	25	25	50	50
	90 days	2	3	50	50	50	50	25	25	0	0	0	0	0	0	25	50	50
	90 days	2	4	0	0	0	0	0	0	0	0	0	0	25	25	25	25	50
	90 days	3	1	100	100	100	50	50	0	0	0	0	0	0	0	0	0	0
	90 days	3	2	0	0	0	0	0	0	0	0	0	25	25	25	25	25	50
	90 days	3	3	50	50	50	50	25	25	0	0	0	0	0	0	25	50	50
	90 days	3	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50	50
	105 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	105 days	1	2	0	0	0	0	0	0	0	0	25	25	25	25	50	50	50
	105 days	1	3	50	50	50	50	25	25	0	0	0	25	25	25	25	50	50
	105 days	1	4	0	0	0	0	0	0	0	0	0	0	0	25	25	25	50
	105 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	105 days	2	2	0	0	0	0	0	0	0	0	0	25	25	25	25	50	50
	105 days	2	3	50	50	50	50	25	25	0	0	0	0	0	0	25	50	50
	105 days	2	4	0	0	0	0	0	0	0	0	0	0	25	25	25	25	50
	105 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	105 days	3	2	0	0	0	0	0	0	0	0	0	25	25	25	25	25	50
	105 days	3	3	50	50	50	50	25	25	0	0	0	0	0	0	25	50	50
	105 days	3	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50	50
	120 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	120 days	1	2	0	0	0	0	0	0	0	0	25	25	25	25	50	50	50
	120 days	1	3	50	50	50	50	25	25	0	0	0	25	25	25	25	50	50
	120 days	1	4	0	0	0	0	0	0	0	0	0	0	0	25	25	25	50
	120 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	120 days	2	2	0	0	0	0	0	0	0	0	0	25	25	25	25	50	50
	120 days	2	3	50	50	50	50	25	25	0	0	0	0	0	0	25	50	50
	120 days	2	4	0	0	0	0	0	0	0	0	0	0	25	25	25	25	50
	120 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	120 days	3	2	0	0	0	0	0	0	0	0	0	25	25	25	25	25	50
	120 days	3	3	50	50	50	50	25	25	0	0	0	0	0	0	25	50	50
	120 days	3	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50	50

Crop	Growth cycle	Input levels	Constraint	Length of Growing Period														
				0	15	45	75	105	135	165	195	225	255	285	315	345	365+	
SOYBEAN, SUB-TROPICS	105 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	105 days	3	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	105 days	3	3	50	50	50	50	25	25	0	0	0	0	0	25	25	50	50
	105 days	3	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50
	105 days	3	5	100	100	100	100	50	0	0	0	0	0	0	0	0	0	0
	120 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	120 days	1	2	0	0	0	0	0	0	0	0	25	25	25	50	50	50	50
	120 days	1	3	50	50	50	50	25	25	0	0	0	25	25	25	50	50	50
	120 days	1	4	0	0	0	0	0	0	0	0	0	0	0	25	25	50	50
	120 days	1	5	100	100	100	100	100	25	0	0	0	0	0	0	0	0	0
	120 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	120 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	120 days	2	3	50	50	50	50	25	25	0	0	0	0	0	25	25	50	50
	120 days	2	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50
	120 days	2	5	100	100	100	100	100	25	0	0	0	0	0	0	0	0	0
	120 days	3	1	100	100	100	50	50	50	0	0	0	0	0	0	0	0	0
	120 days	3	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	120 days	3	3	50	50	50	50	25	25	0	0	0	0	0	25	25	50	50
	120 days	3	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50
	120 days	3	5	100	100	100	100	100	25	0	0	0	0	0	0	0	0	0
	135 days	1	1	100	100	100	50	50	50	0	0	0	0	0	0	0	0	0
	135 days	1	2	0	0	0	0	0	0	0	0	25	25	25	50	50	50	50
	135 days	1	3	50	50	50	50	25	25	0	0	0	25	25	25	50	50	50
	135 days	1	4	0	0	0	0	0	0	0	0	0	0	0	25	25	50	50
	135 days	1	5	100	100	100	100	100	50	0	0	0	0	0	0	0	0	0
	135 days	2	1	100	100	100	50	50	50	0	0	0	0	0	0	0	0	0
	135 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	135 days	2	3	50	50	50	50	25	25	0	0	0	0	0	25	25	50	50
	135 days	2	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50
	135 days	2	5	100	100	100	100	100	50	0	0	0	0	0	0	0	0	0
135 days	3	1	100	100	100	50	50	50	0	0	0	0	0	0	0	0	0	
135 days	3	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50	
135 days	3	3	50	50	50	50	25	25	0	0	0	0	0	25	25	50	50	
135 days	3	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50	
135 days	3	5	100	100	100	100	100	50	0	0	0	0	0	0	0	0	0	
SUN-FLOWER, TROPICS	135 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	
	135 days	1	2	25	25	25	25	25	0	0	0	25	25	50	50	50	50	50
	135 days	1	3	50	50	50	50	25	0	0	0	25	50	50	50	50	50	50
	135 days	1	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50	50
	135 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	135 days	2	2	0	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	135 days	2	3	50	50	50	50	25	0	0	0	25	25	50	50	50	50	50
	135 days	2	4	0	0	0	0	0	0	0	0	25	25	50	50	50	50	50
	135 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	135 days	3	2	0	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	135 days	3	3	50	50	50	50	25	0	0	0	25	25	50	50	50	50	50
	135 days	3	4	0	0	0	0	0	0	0	0	25	25	50	50	50	50	50

Crop	Growth cycle	Input levels	Constraint	Length of Growing Period														
				0	15	45	75	105	135	165	195	225	255	285	315	345	365+	
SUN-FLOWER, TROPICS	150 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	150 days	1	2	25	25	25	25	25	0	0	0	25	25	50	50	50	50	50
	150 days	1	3	50	50	50	50	25	0	0	0	25	50	50	50	50	50	50
	150 days	1	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50	50
	150 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	150 days	2	2	0	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	150 days	2	3	50	50	50	50	25	0	0	0	25	25	50	50	50	50	50
	150 days	2	4	0	0	0	0	0	0	0	0	25	25	50	50	50	50	50
	150 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	150 days	3	2	0	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	150 days	3	3	50	50	50	50	25	0	0	0	25	25	50	50	50	50	50
	150 days	3	4	0	0	0	0	0	0	0	0	25	25	50	50	50	50	50
	165 days	1	1	100	100	100	50	50	50	0	0	0	0	0	0	0	0	0
	165 days	1	2	25	25	25	25	25	0	0	0	25	25	50	50	50	50	50
	165 days	1	3	50	50	50	50	25	0	0	0	25	50	50	50	50	50	50
	165 days	1	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50	50
	165 days	2	1	100	100	100	50	50	50	0	0	0	0	0	0	0	0	0
	165 days	2	2	0	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	165 days	2	3	50	50	50	50	25	0	0	0	25	25	50	50	50	50	50
	165 days	2	4	0	0	0	0	0	0	0	0	25	25	50	50	50	50	50
165 days	3	1	100	100	100	50	50	50	0	0	0	0	0	0	0	0	0	
165 days	3	2	0	0	0	0	0	0	0	0	0	0	25	50	50	50	50	
165 days	3	3	50	50	50	50	25	0	0	0	25	25	50	50	50	50	50	
165 days	3	4	0	0	0	0	0	0	0	0	25	25	50	50	50	50	50	
SUN-FLOWER, SUB-TROPICS	135 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	135 days	1	2	25	25	25	25	25	0	0	0	25	25	50	50	50	50	50
	135 days	1	3	50	50	50	50	25	0	0	0	0	25	50	50	50	50	50
	135 days	1	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50	50
	135 days	1	5	100	100	100	100	100	25	0	0	0	0	0	0	0	0	0
	135 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	135 days	2	2	0	0	0	0	0	0	0	0	0	0	0	25	50	50	50
	135 days	2	3	50	50	50	50	25	0	0	0	0	0	25	50	50	50	50
	135 days	2	4	0	0	0	0	0	0	0	0	25	25	50	50	50	50	50
	135 days	2	5	100	100	100	100	100	25	0	0	0	0	0	0	0	0	0
	135 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	135 days	3	2	0	0	0	0	0	0	0	0	0	0	0	25	50	50	50
	135 days	3	3	50	50	50	50	25	0	0	0	0	0	25	50	50	50	50
	135 days	3	4	0	0	0	0	0	0	0	0	25	25	50	50	50	50	50
	135 days	3	5	100	100	100	100	100	25	0	0	0	0	0	0	0	0	0
	150 days	1	1	100	100	100	50	50	50	0	0	0	0	0	0	0	0	0
	150 days	1	2	25	25	25	25	25	0	0	0	25	25	50	50	50	50	50
	150 days	1	3	50	50	50	50	25	0	0	0	0	25	50	50	50	50	50
	150 days	1	4	0	0	0	0	0	0	0	0	0	25	25	25	50	50	50
	150 days	1	5	100	100	100	100	100	50	0	0	0	0	0	0	0	0	0
150 days	2	1	100	100	100	50	50	50	0	0	0	0	0	0	0	0	0	
150 days	2	2	0	0	0	0	0	0	0	0	0	0	0	25	50	50	50	
150 days	2	3	50	50	50	50	25	0	0	0	0	0	25	50	50	50	50	

Crop	Growth cycle	Input levels	Constraint	Length of Growing Period														
				0	15	45	75	105	135	165	195	225	255	285	315	345	365+	
WINTER RAPE	45+120 d	3	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	45+120 d	3	2	0	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	45+120 d	3	3	50	50	50	50	25	25	0	0	0	0	0	25	50	50	50
	45+120 d	3	4	0	0	0	0	0	0	0	0	25	25	25	50	50	50	50
	45+120 d	3	5	100	100	100	100	100	25	0	0	0	0	0	0	0	0	0
SPRING RAPE	135 days	1	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	135 days	1	2	0	0	0	0	0	0	0	0	25	25	25	50	50	50	50
	135 days	1	3	50	50	50	50	25	25	0	0	0	25	25	25	50	50	50
	135 days	1	4	0	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	135 days	1	5	100	100	100	100	100	25	0	0	0	0	0	0	0	0	0
	135 days	2	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	135 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	135 days	2	3	50	50	50	50	25	25	0	0	0	0	0	25	50	50	50
	135 days	2	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	135 days	2	5	100	100	100	100	100	25	0	0	0	0	0	0	0	0	0
	135 days	3	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	135 days	3	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	135 days	3	3	50	50	50	50	25	25	0	0	0	0	0	25	50	50	50
	135 days	3	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	135 days	3	5	100	100	100	100	100	25	0	0	0	0	0	0	0	0	0
	150 days	1	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	150 days	1	2	0	0	0	0	0	0	0	0	25	25	25	50	50	50	50
	150 days	1	3	50	50	50	50	25	25	0	0	0	25	25	25	50	50	50
	150 days	1	4	0	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	150 days	1	5	100	100	100	100	100	50	0	0	0	0	0	0	0	0	0
	150 days	2	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	150 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	150 days	2	3	50	50	50	50	25	25	0	0	0	0	0	25	50	50	50
	150 days	2	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	150 days	2	5	100	100	100	100	100	50	0	0	0	0	0	0	0	0	0
	150 days	3	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	150 days	3	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	150 days	3	3	50	50	50	50	25	25	0	0	0	0	0	25	50	50	50
	150 days	3	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	150 days	3	5	100	100	100	100	100	50	0	0	0	0	0	0	0	0	0
	165 days	1	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	165 days	1	2	0	0	0	0	0	0	0	0	25	25	25	50	50	50	50
	165 days	1	3	50	50	50	50	25	25	0	0	0	25	25	25	50	50	50
	165 days	1	4	0	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	165 days	1	5	100	100	100	100	100	100	25	0	0	0	0	0	0	0	0
	165 days	2	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	165 days	2	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	165 days	2	3	50	50	50	50	25	25	0	0	0	0	0	25	50	50	50
	165 days	2	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	165 days	2	5	100	100	100	100	100	100	25	0	0	0	0	0	0	0	0
	165 days	3	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	165 days	3	2	0	0	0	0	0	0	0	0	0	0	25	25	25	50	50

Crop	Growth cycle	Input levels	Constraint	Length of Growing Period													
				0	15	45	75	105	135	165	195	225	255	285	315	345	365+
SPRING RAPE	165 days	3	3	50	50	50	50	25	25	0	0	0	0	25	50	50	50
	165 days	3	4	0	0	0	0	0	0	0	0	25	50	50	50	50	50
	165 days	3	5	100	100	100	100	100	100	25	0	0	0	0	0	0	0
RAPE, SUB-TROP./TROPICS	135 days	1	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0
	135 days	1	2	0	0	0	0	0	0	0	25	25	25	50	50	50	50
	135 days	1	3	50	50	50	50	25	25	0	0	0	25	25	25	50	50
	135 days	1	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	135 days	2	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0
	135 days	2	2	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	135 days	2	3	50	50	50	50	25	25	0	0	0	0	25	50	50	50
	135 days	2	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	135 days	3	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0
	135 days	3	2	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	135 days	3	3	50	50	50	50	25	25	0	0	0	0	25	50	50	50
	135 days	3	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	150 days	1	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0
	150 days	1	2	0	0	0	0	0	0	0	0	25	25	25	50	50	50
	150 days	1	3	50	50	50	50	25	25	0	0	0	25	25	25	50	50
	150 days	1	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	150 days	2	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0
	150 days	2	2	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	150 days	2	3	50	50	50	50	25	25	0	0	0	0	25	50	50	50
	150 days	2	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	150 days	3	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0
	150 days	3	2	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	150 days	3	3	50	50	50	50	25	25	0	0	0	0	25	50	50	50
	150 days	3	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	165 days	1	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0
	165 days	1	2	0	0	0	0	0	0	0	0	25	25	25	50	50	50
	165 days	1	3	50	50	50	50	25	25	0	0	0	25	25	25	50	50
	165 days	1	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	165 days	2	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0
	165 days	2	2	0	0	0	0	0	0	0	0	0	25	25	25	50	50
	165 days	2	3	50	50	50	50	25	25	0	0	0	0	25	50	50	50
	165 days	2	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50
	165 days	3	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0
165 days	3	2	0	0	0	0	0	0	0	0	0	25	25	25	50	50	
165 days	3	3	50	50	50	50	25	25	0	0	0	0	25	50	50	50	
165 days	3	4	0	0	0	0	0	0	0	0	0	25	50	50	50	50	
COTTON, TROPICS	135 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	
	135 days	1	2	0	0	0	0	25	25	25	25	25	25	50	50	50	
	135 days	1	3	0	0	0	0	25	25	25	25	25	25	50	50	50	
	135 days	1	4	0	0	0	0	0	0	0	0	0	25	25	50	50	
	135 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	
	135 days	2	2	0	0	0	0	0	0	0	25	25	25	50	50		
	135 days	2	3	0	0	0	0	0	0	0	25	25	50	50	50		
	135 days	2	4	0	0	0	0	0	0	0	0	25	25	50	50		

Crop	Growth cycle	Input levels	Constraint	Length of Growing Period														
				0	15	45	75	105	135	165	195	225	255	285	315	345	365+	
COTTON, TROPICS	135 days	3	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	135 days	3	2	0	0	0	0	0	0	0	0	25	25	25	25	50	50	50
	135 days	3	3	0	0	0	0	0	0	0	0	25	25	50	50	50	50	50
	135 days	3	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50
	150 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	150 days	1	2	0	0	0	0	25	25	25	25	25	25	25	50	50	50	50
	150 days	1	3	0	0	0	0	25	25	25	25	25	25	25	50	50	50	50
	150 days	1	4	0	0	0	0	0	0	0	0	0	0	25	25	50	50	50
	150 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	150 days	2	2	0	0	0	0	0	0	0	0	25	25	25	25	50	50	50
	150 days	2	3	0	0	0	0	0	0	0	0	25	25	50	50	50	50	50
	150 days	2	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50
	150 days	3	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	150 days	3	2	0	0	0	0	0	0	0	0	25	25	25	25	50	50	50
	150 days	3	3	0	0	0	0	0	0	0	0	25	25	50	50	50	50	50
	150 days	3	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50
	165 days	1	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	165 days	1	2	0	0	0	0	25	25	25	25	25	25	25	50	50	50	50
	165 days	1	3	0	0	0	0	25	25	25	25	25	25	25	50	50	50	50
	165 days	1	4	0	0	0	0	0	0	0	0	0	0	25	25	50	50	50
	165 days	2	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	165 days	2	2	0	0	0	0	0	0	0	0	25	25	25	25	50	50	50
	165 days	2	3	0	0	0	0	0	0	0	0	25	25	50	50	50	50	50
	165 days	2	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50
	165 days	3	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	165 days	3	2	0	0	0	0	0	0	0	0	25	25	25	25	50	50	50
	165 days	3	3	0	0	0	0	0	0	0	0	25	25	50	50	50	50	50
	165 days	3	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50
	180 days	1	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	180 days	1	2	0	0	0	0	25	25	25	25	25	25	25	50	50	50	50
	180 days	1	3	0	0	0	0	25	25	25	25	25	25	25	50	50	50	50
	180 days	1	4	0	0	0	0	0	0	0	0	0	0	25	25	50	50	50
	180 days	2	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0
	180 days	2	2	0	0	0	0	0	0	0	0	25	25	25	25	50	50	50
	180 days	2	3	0	0	0	0	0	0	0	0	25	25	50	50	50	50	50
	180 days	2	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50
180 days	3	1	100	100	100	50	50	50	25	0	0	0	0	0	0	0	0	
180 days	3	2	0	0	0	0	0	0	0	0	25	25	25	25	50	50	50	
180 days	3	3	0	0	0	0	0	0	0	0	25	25	50	50	50	50	50	
180 days	3	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50	
COTTON, SUB-TROPICS	135 days	1	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	
	135 days	1	2	0	0	0	0	25	25	25	25	25	25	25	50	50	50	50
	135 days	1	3	0	0	0	0	25	25	25	25	25	25	25	50	50	50	50
	135 days	1	4	0	0	0	0	0	0	0	0	0	25	25	50	50	50	50
	135 days	1	5	100	100	100	100	100	100	25	0	0	0	0	0	0	0	0
	135 days	2	1	100	100	100	50	50	25	0	0	0	0	0	0	0	0	0
	135 days	2	2	0	0	0	0	0	0	0	0	0	25	25	25	50	50	50

