Agriculture Land Development Guidelines, in Yukon

(Items indicated as * are required for completion of soil based A/S)

Developing a farm requires:

1) field development* involving land clearing, breaking, and seeding to produce a food or forage crop. Under most circumstances field creation will involve the use of heavy equipment and the requirement to disk to a depth of 6". However new land clearing techniques may be developed, and unusual or site specific soil and land characteristics may require novel soil and field development methods. Agriculture Branch shall determine the most appropriate method of land clearing and initial cropping as required and on a case by case basis

2) building support infrastructure such as barns, sheds, pens, fences, wells, shelterbelts, irrigation systems, electricity supply, access routes, etc.

Developing a non-soil based farm does not require field creation, but generally requires greater agricultural infrastructure development.

Be aware: in all Yukon Development Area Regulations[1] , construction of a primary residence is considered secondary, accessory, or ancillary to the agricultural development. Agricultural use was the reason for the land's release and the farm, not the residence is to be created first. Please consult the appropriate Local Area Plan and Development Area Regulation for your property, prior to purchase or application.

Farm Development is expensive. The purpose of this document is to help prospective farmers estimate the magnitude of the costs they face in developing a farm.

The cost schedules are presented as generalized ranges and regularly change. There are too many variables to permit detailed cost estimates: for example, buildings, like fields, come in many sizes, shapes, and particular details. The skill and experience of contractors and of owner-operators can also vary widely.

In estimating the value of "sweat equity" (your time) it is appropriate to use the value of general labor ($25/hour) for tasks such as fencing, and general helper; $40/hour for semi-skilled work such as rough carpentry. When using one's own heavy machinery, the prevailing equipment charge-out rate

(1) [1] http://www.emr.gov.yk.ca/landplanning/local-area-plans.html

provides a fair standard value. Applicants should check with professional land developers, and equipment hire companies. Remember, just because you own equipment it is not considered free, and should be charged at fair value to your project/farm plan

Likewise, for building workshops, and barns, a professional average cost-per-square-foot can be used.

1.0 Land Development

The costs of land development depend on vegetation cover, underlying soils, terrain, time of year, methods employed, type of equipment used, and the development objectives.

1.1 Land Clearing*

During the farm planning process consideration of leaving stands or rows of existing trees as shelterbelts and shade cover, or for Agroforestry and Silvopasture techniques should be undertaken (see Shelterbelt section for development credits)

Merchantable timber is required to be salvaged as a term of any Agreement for Sale or lease. Forestry Management Branch, as the qualified professionals, assess lots for timber volume. As part of the clearing process, timber harvesting should be costed appropriately. Timber harvest methods should also take account of how the root/stumps will be ultimately removed during field creation.

Vegetation cover below 2800' elevation occurs in these general groupings:

1. Open (scattered light aspen and willow with some small conifers)
2. "Buck brush" dwarf birch and/or thick willow and scattered conifers
3. Light aspen and old forest fire areas
4. Medium timber (open canopy with timber generally less than 90 yrs old) or deforested with optimal 2'+ stump height remaining.
5. Heavy timber (mature spruce/pine with heavy and thick branches down to ground and a nearly closed canopy).
6. Timber harvested, sub-optimal stump height remaining

Underlying soils must also be considered. For example clay, moisture content and occurrence of permafrost will affect optimal timing and costs of clearing.

The costs of machine clearing rise with increasing volumes of vegetation to remove, increasing difficulty of removing root clumps and stumps, and increasing clay content.

Willow root clumps are notoriously difficult to remove with conventional bladed machinery, and alternative methods should be considered.

During clearing, non-merchantable woody materials are to be removed from the cleared field area. Any field area used for storage of woody material is not included as "cleared" under the terms of the Agreement for Sale. Such woody material (generally Ramial wood) is an important source of on-farm organic matter and procedures to incorporate this into the soil are supported.

Bladed machines are best used in winter; forestry mulchers and subsoilers are designed to work through frost and are generally suitable for year round use. With bladed machines it is important to minimize organic layer and topsoil loss when removing root balls if woody debris is to be burnt. Soil in the root balls will create a dirtier, polluting burn, and the extra soot produced will create an increased albedo effect in winter.
If woody debris is to be chipped and respread upon the field, then topsoil and organics in the rootballs are returned in an organics laden mulch.

There is no woody debris to deal with when using a forestry mulcher.

YESAA evaluations will include Species At Risk legislation, however migratory bird nests are not to be destroyed by land clearing thus clearing should halt and avoid areas where nesting birds are observed. In certain circumstances clearing will not be permitted from May 1 until Aug 26th, this generally being the nesting season of migratory birds in the Yukon

1.2 Land Breaking*

The objective is to bring the field into the finished form of a seedbed as quickly as possible. This is a results based activity.

A subsoiling forestry mulcher will prepare an acceptable seedbed as it clears the ground, combining clearing, breaking, root raking, and stick picking in one action.

Other techniques, specific to certain land types and ground cover may also achieve the same result without use of heavy equipment. Such techniques should be discussed with Agriculture Branch during the development of the Farm Development Plan. Agriculture Branch shall make the final decision regarding whether other techniques will achieve the desired result of forming an acceptable seedbed.

Following clearing and woody debris removal with a blade, the raw site is disked and root raked. Disking is required to at least a depth of 6". The intensity and number of these treatments will vary with the amount of roots and debris in the soil and with the objectives of the owner. To create the seedbed, multiple passes of disking and root raking may be required before fertilizing and seeding.

2.0 Land development* cost ranges (development credit value guide)

It is important to remember this is a guide, actual up to date costs and rates should be used in the Farm Development Business Plan as the values in the Plan form the basis of the Development Credits in any subsequent Agreement for Sale

On average, the contract package costs of meeting minimal requirements of clearing, breaking, and initial crop raising for title vary from $1500 - $2500/acre depending on the variables mentioned above. A finished-form field with merchantable timber salvaged, woody debris utilised, land cleared with a seedbed raising a crop may vary from $1800 to $4000/acre (less value of salvaged timber) depending on the variables mentioned above.

Broken out in components, land development costs (credits) average as follows:

2.1 Land clearing $/acre post timber salvage

2.1.1

Blade equipped machinery

Cover type

Buck-brush and willows	$400 - $600
Light aspen and burns	$600 - $750
Medium timber	$750 - $900
Heavy timber	$1000 - $1500

* add $500/acre if logged within 6" of ground level

Utilization of woody debris

Chipper and backhoe	$600/hour
Spreading	$150/hour

Tractor driven machinery

Land breaking

- 1 pass each of root raking and disking: $120/acre
- 2 passes each of root raking and disking: $240/acre

Disking, Fertilizing, and Seeding

- Disking = average $60/acre, 1 pass
- Seeding = average $60 - $150/acre (includes seeding fall rye or oats)
- Fertilizing = average $150/acre @ 150lbs - $250/acre @ 300lbs
- Rolling/packing = $60/acre

2.1.2

Forestry mulching equipment with subsoiler

Cover type

Buck-brush and willows	$2000
Light aspen and burns	$2000
Medium timber	$2300
Heavy timber	$2500

Land Breaking

Incorporated in clearing above $0

Fertilizing, and Seeding

- No-till seeding (fertilizer@150 lbs, seed, and drill) = $235/acre
- Rolling/packing = $60/acre

2.2 Equipment rates

- Bulldozer D7, D8, Tractor, Backhoe, Mulching equipment etc – contact appropriate contractor/hire company/provider for up to date rates

3.0 Fencing

There are five generic types of fencing common in the Yukon:

- 7’ high page-wire game fencing;
- wire fencing: 4’ page-wire with 1 or 2 wires above it, or 3 strands of barbed wire
- Wooden fences (post and board, post and rail, russell rail, snake-log)
- Specialty fences: electric fences and plastic mesh.
- Wildlife Friendly Fences

Some types of fences are required by legislation – for example, game ranches must enclose with 8’ page-wire game fencing. Other fences may be suggested by circumstances: an abundance of fire-killed pine may make russell or post-and-rail fencing attractive. Russell fences maybe advantageous where bedrock and stony soil is common, or in boggy, acidic soils that can rot untreated posts in just a few years.

Treated posts, or pressure-treated are good investments – untreated posts can decay within as few as 4 years in some conditions. Posts for game fence are commonly placed at 20’ intervals; seven-foot posts spaced 15’ to 20’ apart are customary for barbed wire, 4’ page wire, and electric wire.

3.1 Fencing Costs

Wire Fence Materials

Fence wire:
4' page wire (14 gauge mesh) > $550 / 1000’
Pressure treated Fence posts > 4.25”x 7' = $7.99 each
8' game fence > $2,030 / 1000’ (6"x6"squares)
Pressure treated fence posts > 6”x12’ = $34.99 each
Barbed wire > $50 / 1000’
Electric fence wire (high tensile wire) > $20 / 1000’
Fiberglass fence posts > 48” = $5.49 each

Wood fences

Russell Fences: these use local materials, are resistant to rot, but have high labor costs for both cutting and hauling fire-killed pine poles and for assembling. A contractor in 2005 built 3500 feet of Russell fence (250 14' panels) for a cost of $25,000 ($100/panel). This included cutting and hauling poles and labor with benefits.

Post and rail: typically chosen if local materials are abundant nearby. Costs of obtaining and distributing materials vary with access to materials. Applying creosote to post ends, and erecting fence: labor at $20/hr.

***Example**: one Yukon farmer, using equipment to clear the fence line, pound pressure treated posts at 16' intervals, estimated costs of $8,000 for one mile of 3-strand barbed and smooth wire on a 160-acre property. (this was total project costs, including materials, equipment rental and labor)*

Wildlife Friendly Fences

Consist of 3 strands of wire, with at least the top and bottom being smooth wire. The lower wire must be at least 18" from the ground and the upper no more than 42" above the ground. Wildlife Friendly Fences permit the movement of wildlife in and out of the property, whilst restraining domestic animals within the property. They are particularly useful for grazing agreement lands..

Gates

Metal gates:
6' > $139.00 ea
8' > $159.99 ea
10' > $184.99 ea
12' > $199.99 ea
14' > $234.99 ea

Add approximately $150 for additional parts and labour to install a gate.

4.0 Facilities

4.1 Fertilizer and Grain Bins

- Grain and/or Fertilizer bins, 49 metric tons, coated, welded steel: $8180 F.O.B. Alberta. For welded steel bins, shipping costs from Alberta can be large. The need for pilot cars can be avoided if bins are built to 11'6" dia. X 15' high. Shipments of one: $4300; of two: $2150 ea.
- Another quote, including a 12' base is $12,995.00 F.O.B. Whitehorse.
- Grain bin (no fertilizer), 54 metric tonnes, bolt-together: $4500 F.O.B. Alberta

4.2 Buildings

- Conventionally built houses: $130 - $150 / square foot
- Metal sheds and barns: uninsulated, no systems, approximately $40/ sq. foot for materials; $80/ft^2 for completed structure with foundation but no heat.
- Wooden sheds, rough lumber approximately $12/ sq. foot.

4.3 Greenhouses

The simplest greenhouses are also the cheapest, made from poles or scrap lumber and covered with plastic or salvaged windows. They are also suitable mainly for hobby production. Commercial production requires a more sophisticated greenhouse, with vastly different features and construction costs:

Sourced from "*Starting a Commercial Greenhouse Business in Alberta*" available through Alberta Agriculture:

The greenhouse business is very capital intensive with the basic structure erected ranging in price from $6-$8 per sq. ft. depending on such major options as covering materials, ventilation systems, etc. Next we need to provide heating (both the source and distribution), irrigation (source and distribution), electric service (main connection and interior work), nutrient injection system for the irrigation water complete with pH and E.C. controllers, environmental computer to "run" the heating/cooling requirements with the option of adding humidity, CO2 and irrigation control.

Now we need to build some type of support buildings for storage/shipping, staff room, office, etc. Add in some pesticide application equipment, concrete walkways, benching or a crop support system, high pressure lighting for the starting and/or finishing areas AND before long you have a total investment of $15-$25 per sq. ft. Note these are Alberta costs.

4.4 Roads

Three grades of road are common; since costs vary with topography (how much earth must be moved for cuts and fills, firmness of substrate, and distance from gravel pit, some general assumptions are presented. These are: flat terrain, well drained and firm soils, and 20-30 minutes from gravel pit. It is further assumed that the right-of-way has been previously cleared.

- finished driveway 100 m, x 5 m wide, crowned, ditch on one side, $9000: Subgrade work, $1400; 1' of pit run gravel waterpacked $4000; 6" crushed rock water pack on top $3500.
- farm access road, 100m x 4 m wide, crowned, ditch on one side, $2600: Subgrade work $600, 6" pit run gravel water packed $2000.
- Trail, 100 m x 3 m, subgrade work, smoothing and leveling: $600

4.6 Wells

Costs of well drilling vary with the type of equipment used, whether the substrate is rock or till, the depth to water, and the effort needed to develop the well. The costs given assume straightforward drilling and within 50 kms of Whitehorse. It does not include pumps, tanks, and water systems. There is no difference between rotary and impact drilling costs.

With casing = $60/ft
In bedrock without casing = $40/ft

4.7 Irrigation

Often bought as used systems, costs for these vary with the diameter of pipe used, the length of line needed, the size of pump, and the system design (pivot vs. wheel line). The difference between used and new equipment is typically 60%; because they are a newer technology, used center pivot systems are rarely available.

One Yukon operator installed used equipment (2 used wheel lines) for 100 acres for $184,000 ($92,000 equipment, equal amount for labor). Before realistic costing can be done, an irrigation system must be planned meticulously to select an appropriate configuration of equipment and design. The Agriculture Branch has an irrigation guide to help develop irrigation systems.

Approximate irrigation equipment capital costs in 2007 FOB Lethbridge, Alberta				
Center pivot system	**per foot**	**#**	**New**	**Used**
1050' Pivot		1	$50,000	N/A
8" PVC	$4.20	1300	$5,460	
PVC installation	$2.00	1300	$2,600	
20 hp diesel pumping unit		1	$19,000	$7,000
TOTAL			**$77,060**	
Wheel move with aluminium mainline				
1/4 mile system	$20,000	2	$40,000	$6,000
7" - 2x30' with risers	$180	44	$7,920	
40 hp diesel pumping unit		1	$25,000	$10,000
TOTAL			**$72,920**	
Wheel move with buried PVC mainline				
1/4 mile system	$20,000	2	$40,000	$6,000
8"	$2.10	2640	$5,544	
PVC installation	$2.00	2640	$5,280	
40 hp diesel pumping unit		1	$25,000	$10,000
TOTAL			**$75,824**	

4.8 Dams and Dugouts

Alberta Agriculture publishes an informative guide to constructing dugouts www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/eng4696. Costs vary with location, size, substratum, and design. One Yukon farmer constructed a dugout 30' x 40' x 15' deep for an estimated cost of $1/cubic foot including fencing and lining. This corresponds with Agriculture Canada estimates of $16,000/ average dugout in prairie regions. See hourly equipment rental rates and calculate the volume of material you propose to move and the hourly capacity of the equipment you would employ.

One Yukon farmer estimated a cost of $1.00/cubic foot for a finished dugout, including excavation, lining, and fencing.

4.9 Ditches

Average estimates: $10/running foot @ 10' deep.

5.0 Shelterbelts, Agroforestry, Silvopasture

Trees have traditionally been important elements of temperate agricultural systems around the world, but there has been increasing separation of agriculture, forestry and nature over the past few decades[2]

There is value in utilizing trees within food production. Development credit will be awarded to the equivalent value of planted trees for trees left in situ, or for those specifically planted for agricultural application as detailed in the Farm Development Plan.

6.0 References

This reference document was prepared by Agriculture Branch with direct input from local farmers. These costs are guidelines only, for accurate costs tailored to your specific project please search online and contact specific dealers for prices.

[2] [1] Smith et al, 2012, A European perspective for developing modern multifunctional agroforestry systems for sustainable intensification, Renewable Agriculture and Food Systems: 27(4); 323–332