



# AERC Inc.

Agriculture Environmental Renewal Canada Inc.

## CANADIAN FORGAE PEARL MILLET (CFPM) 101

### Why forage pearl millet?

- A highly drought tolerant crop
- Adapted to soils low in fertility (sandy to loamy-sandy soils) and to < pH (5.5)
- High yielding, high protein forage crop for dairy, beef, sheep and horses
- Can be used for grazing, as green chop and silage,
- Rapid regeneration capacity
- Complete absence of prussic acid
- Used in rotation, excellent control of root lesion nematodes in potato, tobacco and vegetable crops
- Helps build soil organic matter when used as a cover crop
- Frost sensitive and hence produces no volunteer plants in the following season



# Forage Pearl Millet CFPM 101

## Crop Management for Forage, Grazing and Silage

<b>Planting</b>	Plant in a well-prepared seedbed in late spring, when soil temperatures are above 12°C (54°F) with no risk of frost. In light soils use a cultipacker prior to planting to create a flat and even seedbed.
<b>Seed rate and planting depth</b>	Plant seed at a uniform ½” depth and use a seed rate of 4 kg per acre.
<b>Row spacings</b>	Seed in 7.5” rows with spacing of about 3” between plants in the row.
<b>Planting equipment</b>	Use a grain drill, grass seeder, or a no-till drill. Some conventional drills can be used on sandy soils with some modifications. For example, an International 510-grain drill can be modified to seed rates as low as 3.5 kg per acre.
<b>Seedbed packing</b>	Press seed into the ground with a press wheel. Do not pack the ground with a heavy land packer after planting. CFPM 101 is <u>not recommended for heavy clay soils.</u>
<b>No-till planting</b>	CFPM-101 can be seeded effectively with no-till drills or grain drills. Excessive residues will hinder the establishment. Using press wheels on the drill or a light cultipacker is recommended.
<b>Fertilizer</b>	Fertilize according to soil fertility (roughly 70% of forage corn fertilizer) Apply half of N and all of P and K fertilizer at planting and the rest after the first cut. The second N application is critical for re-growth and crude protein levels.
<b>Establishment</b>	Millet normally emerges four days after planting. Early season growth is slow and it is important to have low weed pressure. When the plant is about 6” tall, has 4-5 tillers it is considered established.
<b>Weed control</b>	As most weeds are hosts to root lesion nematodes excessive weed pressure can neutralize the nematode suppression benefits of forage millet.
<b>Control of grass weeds</b>	If grass weeds are heavy use Glyphosate (Roundup) prior to planting. Two pre-plant tillage operations are recommended, first to stimulate germination of weeds, and later, to kill weed seedlings prior to planting.
<b>Control of broad leaf weeds</b>	Use Peak 75 WG at the rate of 13.3 g/ha plus non-ionic surfactant at 0.2% v/v (or crop oil concentrate at 1.0% v/v) plus Banvel-280 (or BANVEL-11) at 0.3% liter/ha in 225 liter of water/ha. Another option is Basagran at 1.7 to 2.2 liter/ha in 20 gallons of water. <u><a href="#">Before application of herbicides ensure that you read all labels and follow instructions.</a></u> For details see OMAF publication # 75 on `Weed Control`.
<b>Forage harvest</b>	Harvest with a regular forage harvester. Multiple cuttings are recommended since more growth and yield can be obtained. First cutting would be ready in about 55-60 days after planting. Cutting at 3’ or lower results in higher crude protein. Second harvest will be in about 30 days after the first cut. Leave a good 6” of stubble to ensure proper tillering and a faster re-growth. Conditions permitting a third cut can be obtained.
<b>Grazing</b>	For grazing, allow four to six weeks to establish a decent pasture. Rotate animals to leave about 6”-8” of stubble for faster re-growth and cut the field level after.
<b>Silage</b>	Pearl millet makes good silage. It can be fed as green chop too. However, due to the length of drying time required wrapping is recommended if baled

### Forage Yield & Quality of CFPM 101 over locations, Canada 1996-2002<sup>1</sup>.

- ❖ Produces 6 -1 tons/ha of dry matter
- ❖ Crude protein 15% and above, twice the levels of corn
- ❖ Similar Net Lactation Energy and Total Digestible Nutrients levels as corn
- ❖ Lower input costs than corn
- ❖ No prussic acid
- ❖ Excellent forage crop for dairy, beef, sheep and horses
- ❖ Used in rotation, excellent control of root lesion nematodes in potato, tobacco and vegetable cops
- ❖ Used as cover crop helps build soil organic matter

Region	Dry matter yield (t/ha)	Forage quality parameters (% of dry matter)						
		Total protein yield (kg/ha)	Crude protein (%)	NDF (%)	ADF (%)	IVDMD (%)	Ca	P
Southwestern Ontario	10.9	1750	16.1	57.4	30.6	86.3	0.59	0.41
Northeastern Ontario	3.0	500	16.2	58.1	32.3	82.0	0.50	0.36
Eastern Ontario	8.3	1310	15.8	60.6	36.4	61.5	0.58	0.35
New Brunswick	4.4	510	11.6	NA	34.5	60.1	NA	NA
Québec	6.4	1030	16.1	60.0	32.0	81.3	0.73	0.37
Saskatchewan	4.0	690	17.2	55.4	26.2	87.1	0.53	0.30
Mean	6.2	965	15.5	58.3	32.0	76.4	0.58	0.35

1. Forage quality data are means of first and second harvests, except at Delhi in 1998 and 1999. At Delhi quality data are means of three harvests in 1998 and 1999. NA = Not analyzed. NDF= Neutral Detergent Fiber, ADF= Acid Detergent Fiber, IVDMD = In Vitro Dry Matter Digestibility, Ca = Calcium, P=Phosphorous.

## Forage Pearl Millet CFPM 101

### Crop Management: For Nematode Control in Tobacco-Rye rotation

<b>End of the tobacco season</b>	At the end of the tobacco season, plant your rye as in traditional rotation.
<b>Spring</b>	Kill the rye with glyphosate before planting tobacco in adjacent fields. If you are planning to no-till pearl millet, burn off the rye around second week of April.
<b>Planting</b>	Work the rye field and plant CFPM 101 about the first week of June. Plant about half-an-inch deep at a seed rate of four kilos per acre in 7.5 inch rows. Use a grain drill with a grass seeder, conventional grain drill or no-till drill. Ensure that the rye stubble has broken down to allow CFPM 101 to emerge and get established. Press seed into the ground with a press and not a packer.
<b>Cutting management</b>	Cut at least once, preferably twice during the summer, taking the first cut about eight to nine weeks after planting when millet is 2.5 feet tall. Take a second cut about a month later. Leave six to eight inches of stubble. Avoid using sickle type mower as it leaves too much bulk covering any re-growth.
<b>Fall season</b>	In the fall, leave CFPM 101 to grow until frost kills it. Remaining growth on the soil works as an excellent cover crop and will retain snow nicely. Maximum nematode suppressive action is achieved if the crop remains in the ground until spring since nematodes will feed on it before spring tillage
<b>Ploughing the residue</b>	Plough the remaining CFPM 101 residue in the spring and plant tobacco without the use of fumigants for nematode control
<b>Breakdown of residue</b>	CFPM 101 residue breaks down very quickly after being used as a cover crop so working it in is easy.
<b>Planting tobacco-rye and rotation</b>	After tobacco season plant rye as in traditional rotation. Continue with CFPM 101 on a two-year rotation

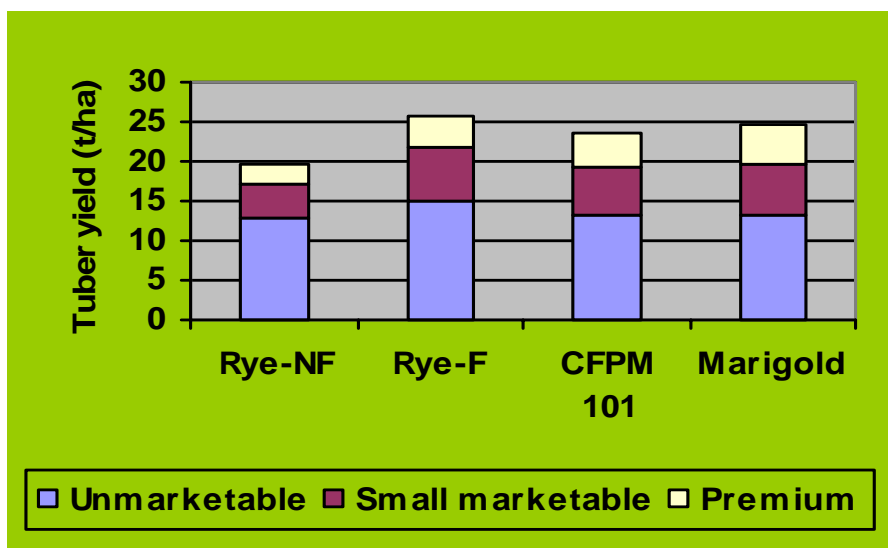
# Forage Pearl Millet CFPM 101

## Crop Management: Rotation Crop for Forage, Nematode Control and Addition of Organic Matter in Potato

Pearl millet is a 'win-win' rotation crop for potato because it yields high quality forage in multiple cuts, provides control of root lesion nematodes and adds organic matter to the soil. The management recommendations provide for tobacco can also be suitably adapted for a potato-pearl millet rotation

Rotation systems in potato include 'one-year-in-two' and forms of continuous potatoes (two or more consecutive years of potatoes). When potatoes are grown no more than one year in two and cereals and forages included in the rotation improve soil productivity – maintain higher levels of organic matter levels resulting in reduced soil erosion. This is important as potatoes produce little plant residue and contribute small quantities of organic matter to the soil.

Research at AA-FC, Saint-Jean-sur-Richelieu and Delhi has shown that forage pearl millet adds significant amounts of soil organic matter as it produces higher plant residue yields. Forage millet CFPM 101 reduces root lesion nematode (RLN) populations in the soil and roots in potato after one year crop rotation compared to oats and barley. Total and marketable potato yields were greater following CFPM 101 than following rye (non-fumigated) rotation and were equal to the rye-fumigated rotation showing that CFPM 101 controls RLN in the subsequent potato crop (Figure below). CFPM 101 rotation yielded 5% more premium tubers, 4% more of small marketable tubers, and showed a 10% reduction in unmarketable tubers, compared to non-fumigated rye.



## Forage Pearl Millet CFPM 101

### Benefits of CFPM 101 when used as a Cover Crop

<p>For use as a cover crop CFPM 101 is seeded in the spring to protect the soil. Use high seed rate of 5 to 6 kg/acre with a between row spacing of 7 inches and 2 to 3 inches within rows. Plant after third week of May when the soil temperatures are above 12°C with no risk of frost. Use a grain drill as broadcast would result in uneven stands. CFPM 101 grows enough before freeze-up to provide protection to the soil. Other benefits, such as addition of organic matter, nutrients and weed suppression are also derived using CFPM 101.</p>	
<b>Organic matter</b>	Organic matter from the forage millet provides a kind of nutrient bank, releasing nutrients for crop use. Organic matter improves soil productivity and maintains soil structure.
<b>Nutrient addition to the soil</b>	Significant amounts of nutrients are added to the soil improving fertility status and soil structure benefiting the next crop (Table, below)
<b>Erosion control</b>	The purpose of a CFPM 101 as a cover crop is to protect the bare, erosion-prone land from wind. Soils that have lost much of their organic material become even more susceptible to wind erosion and derive most benefit from growing CFPM 101 as cover
<b>Snow capture</b>	When CFPM 101 is used as a cover crop it has the added benefit of capturing snow over the winter to enhance moisture conditions in the spring.
<b>Weed control</b>	Due to the aggressive nature of forage pearl millet at a high density can suppress weeds thus benefiting the subsequent crop.
<b>Over-wintering</b>	CFPM 101 will not over-winter as frost will kill all the plants
<b>Cutting management</b>	The management (planting dates and seeding rates) for the cover crop is similar to the crop grown for forage. The crop should be cut when the plants are about 3-4 feet tall. The biomass can be left in the field to enrich the soil. The last re-growth can be left standing over the winter. In the next spring all the residue should be incorporated into the soil by plowing before planting the next crop. Use a rotary mower is preferred using full PTO speed to cut the material finely and to prevent the smothering out of re-growing plants in the tracts.
<b>Seeding new crop</b>	Direct seed the new crop into the cover crop residue

**Biomass nutrient content in Forage pearl millet CFPM 101 and Rye<sup>1</sup>**

Crop	Dry matter Yield (t/acre)	N	P	K	Nutrients \$/acre
		(Kg/acre)			
Forage pearl millet CFPM 101	3.5	44.5	13.3	63.0	73.86
Cereal Rye	2.0	28.0	4.5	32.0	38.97

1. Total fertilizer equivalent based on two cuts.