

COVER CROPS SPECIES (Agronomic Protocol)

Adapted from: CALEGARI, A.; TAIMO, J.P.C. Practical Guide of Conservation Agriculture. Austrian Cooperation and Ministry of Agriculture, Sofala, Mozambique, 2006, 106 p. (in Portuguese) .

Scientific Name	Common Name	Seeds/ meter into the row (single crop)	Distance between rows (cm)	Planting season (rain season)	Main advantages and alternatives of use	Dry mass production	Management
<i>Canavalia brasiliensis</i>	Brave of Ceará beans	6-10	50-100	Warm	Legume that grows in soil of medium fertility, supports very dry conditions (after root development), allelopathic effects on weeds, nitrogen fixation and nutrient recycling. Undetermined plant that covers very well the soil surface. Good effects for maize, rice, sorghum, millet, beans, cotton, etc.	5-7 tons/ha	Knife-roller at the flowering stage, slash, herbicides.
<i>Canavalia ensiformis</i>	Jack bean	6-10	30-50	Warm	Can develop in soil with low fertility, supports dry conditions, allelopathic effects on many weeds; nitrogen fixation, nutrients recycling. The seed sizes are big, and many times can be difficult to use.	5 – 6 tons/ha	Knife-roller at the flowering stage, slash, herbicides

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<i>Pennisetum glaucum</i>	Pearl millet	12-15	17-25	Warm	Can develop in soil with medium fertility, support dry conditions; strong allelopathic effects on many weeds; high biomass production and great capacity of K recycling. Strong root system that can achieve around 2-3 m soil depth. Promote soil biodiversity and this can decrease soil pathogens populations (<i>Fusarium</i> sp., <i>Sclerotinia sclerotiorum</i> ; etc.). It can be used mixed with legumes such as crotalarias, cowpea, etc. It can be sowed isolated and/or oversowing on soybean, maize, bean (around 20-30 days before harvesting). Also it can be used as a forage for animals grazing and after it regrow and used as a soil covering.	8-10 tons/ha	herbicide
<i>Setaria italica</i>	Moha grass – IAPAR	40-50	20-40	Warm	Grows fast (40-50 days after planting can be managed); develops in medium fertile soil; high soil protection; good weed control; can decrease the soil nematode population (<i>Meloidogyne incognita</i>); high nutrient recycling; favourable soil physical effects of root system. Forage for grazing animals and re-growth potential.	3 – 4.5 tons/ha	Slash, herbicides
<i>Eleusine coracana</i>	Giant chicken foot grass	50-70	20-40	Warm	Grows quite fast; develops in medium fertile soil; high soil protection; allelopathic effects on weeds; high nutrient recycling; important physical effects of root system (that can produce more than 5 tons./hectare). Excellent for animals grazing and re-growth potential.	4 – 10 tons/ha	Slash, herbicides

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<i>Cajanus cajan</i>	Pigeon pea	20-25	30-50	Warm	Grows well in acid soil of low fertility; strong root system for breaking compacted layers that can attain more than 3 meters in depth; good soil protection; allelopathic effects on weeds; high nitrogen fixation, nutrients recycling and increases phosphorus availability. Excellent forage for animals grazing with high protein content and also with re-growth potential. Can be used in a protein "bank" for animals and also as a wind-break.	3 - 12 tons/ha	Slash, knife-roller at the flowering stage, herbicides
<i>Cajanus cajan</i>	Dwarf pigeon pea	20-25	30-50	Warm	Grows well in soil of low/medium fertility; good root system for breaking compacted layers that can attain more than 1 meter in depth; good soil protection; allelopathic effects on weeds; high nitrogen fixation, nutrient recycling and increases phosphorus availability. Excellent forage for animals grazing with high protein content.	2 – 8 tons/ha	Slash, knife-roller at the flowering stage, herbicides
<i>Mucuna pruriens</i>	Black mucuna var.	7-10	40-60	Warm	Grows well in acid soil of low fertility; good root system, excellent soil protection; allelopathic effects on many weeds; high nitrogen fixation, nutrient recycling. Can decrease the phyto-nematode population in the soil. Forage and toasted grains can be used as animal fodder, and also the grains properly toasted can be used by humans (to make biscuits, cake, coffee, etc.).	2 – 5 tons/ha	Knife-roller at flowering stage and beginning of the pods stage, slash, herbicides

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<i>Mucuna pruriens</i>	Grey mucuna var.	7-10	40-60	Warm	Grows well in soil of medium/low fertility; good root system, excellent soil protection; allelopathic effects on many weeds; high nitrogen fixation, nutrient recycling. Can decrease the phyto-nematode population in the soil. This species normally presents resistance to <i>Fusariosis</i> sp. and also for some viruses. Forage and toasted grains can be used as animal fodder, and also the grains properly toasted can be used by humans (to make biscuits, cake, coffee, etc.).	2 – 6 tons/ha	Knife-roller at the flowering stage and beginning of the pods formation, slash, herbicides
<i>Mucuna pruriens</i>	Dwarf mucuna var.	10-12	40-60	Warm	Grows well in soil of medium/high fertility; good root system; presents a determined growth habit and good soil protection; some allelopathic effects on many weeds; nitrogen fixation, nutrient recycling. Can decrease the phyto-nematode population in the soil. Forage and toasted grains can be used as animal fodder, and also the grains properly toasted can be used by humans (to make biscuits, cake, coffee, etc.).	2 – 4 tons/ha	Knife-roller at the flowering stage and beginning of the pods formation, slash, herbicides
<i>Crotalaria juncea</i>	Sunhemp	20-30	20-40	Warm	Very fast growth, covering the soil; grows well in soil of medium fertility; allelopathic effects on many weeds, nitrogen fixation, nutrient recycling. Good nematode control; forage can be used as animal fodder.	3 – 12 tons/ha	Knife-roller at the flowering stage, slash
<i>Crotalaria ochroleuca</i>	Crotalaria ochroleuca	20-40	30-50	Warm	Grows well in soil of medium fertility; some allelopathic effects on many weeds, nitrogen fixation, nutrient recycling.	2 – 6 tons/ha	Knife-roller at the flowering stage, slash

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<i>Crotalaria lanceolata</i>	Crotalaria lanceolata	20-40	30-50	Warm	Grows well in soil of medium fertility; some allelopathic effects on many weeds, nitrogen fixation, nutrient recycling.	2 – 4 tons/ha	Knife-roller at the flowering stage, slash
<i>Crotalaria spectabilis</i>	Crotalaria spectabilis	20-40	30-50	Warm	Grows well in soil of medium fertility; allelopathic effects on many weeds, nitrogen fixation, nutrient recycling. Good nematode control.	2 – 4 tons/ha	Knife-roller at the flowering stage, slash
<i>Crotalaria grantiana</i>	Crotalaria grantiana	20-40	30-50	Warm	Good development in soil of medium fertility; some allelopathic effects on many weeds, nitrogen fixation, nutrient recycling.	2 – 4 tons/ha	Knife-roller at the flowering stage, slash
<i>Arachis hypogaea</i>	Horse groundnuts	15-20	40-60	Warm	Grows well in soil with medium fertility; good soil protection with high weed control; nitrogen fixation, nutrient recycling; good nematode control; grains for human and animal food; forage or residues can be used as animals fodder.	3 – 5 tons/ha (forage or residues)	Normally, the grains are harvested , the residues remaining on the soil
<i>Dolichos lab lab</i>	Lablab	15-25	30-50	Warm	Can develop in soil with medium/ low fertility, supports some dry conditions, allelopathic effects on many weeds; nitrogen fixation, nutrient recycling. Can multiply some soil nematodes. Forage and grains can be used as animals fodder. Be careful with the seed storage as they are easily attacked by seed pests.	3 – 6 tons/ha	Knife-roller at the flowering stage, slash, herbicides
<i>Avena strigosa</i>	Black oat – IAPAR 61	40-55	20-40	Cold	Grows in soil with medium fertility; good soil cover; good allelopathic effects on weeds; good root system; high nutrient recycling; long cycle and good forage that permits 2 cuts or grazing, and re-growth again to cover the soil.	3 – 8 tons/ha	Knife-roller when the grains are at the milk stage, slash, herbicides

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<i>Avena sativa</i>	White oat – UFRGS 19	45-65	20-40	Cold	Grows in soil with medium/high fertility; good soil cover; good allelopathic effects on weeds; high nutrient recycling; good forage that permit 2 cuts or grazing, and re-growth again to cover the soil.	3 – 6 tons/ha	Normally the grains are harvested; Knife-roller when the grains are at the milk stage, slash, herbicides.
<i>Secale cereale</i>	Rye – IAPAR PG 950	40-50	20-40	Cold	Develops in acid soil with low fertility; good soil cover; good allelopathic effects on weeds; excellent root system; high capacity for nutrient recycling; good forage that permits 2 cuts or grazing, and re-growth again to cover the soil. Can be mixed with oats for forage. Can be used as forage, and after that, it can re-grown and produce seeds.	3 – 8 tons/ha	The grains can be harvested; knife-roller when the grains are at the milk stage, slash, herbicides.
<i>Lolium multiflorum</i>	Raygrás	50-70	20-30	Cold	Normally, it grows well in soil with medium fertility; good soil cover; good allelopathic effects on weeds; good root system that can increase soil aggregation; high nutrient recycling; good forage that permit 2 cuts or grazing, and re-growth again to cover the soil. Can be mixed with rye and also with oats for forage.	2 – 6 tons/ha	Slash, herbicides

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X <i>Triticosecale</i>	Triticale	45-60	20-40	Cold	Grows in soil with low/ medium fertility; good soil cover; good allelopathic effects on weeds; well developed root system; high nutrient recycling; good forage that permit 2 cuts or grazing, and re-growth again to cover the soil. Can be used by forage, and after that, it can re-grown and produce seeds.	3 – 5 tons/ha	Knife-roller when the grains are at the milk stage
<i>Raphanus sativus</i>	Oil seed radish	18-25	20-40	Cold	Grows in soil with medium fertility; good soil cover; good allelopathic effects on weeds; some varieties have a very strong root system that can break some compacted layers; high nutrient recycling (mainly nitrogen and phosphorus); good forage that permit 2 cuts or grazing, and re-growth again to cover the soil. Can be mixed with oats, rye, or triticale and used as forage for animal fodder, after that it can re-grow and cover the soil. In some areas it is recommended to be mixed with a grass to produce a mulch with a high C:N ratio, remaining more time covering the soil.	3 – 9 tons/ha	Knife-roller at the flowering stage, slash, herbicides.
<i>Lupinus albus</i>	White lupin	15-20	20-50	Cold	Grows in soil with low/ medium fertility; good soil cover; the good root system can break compacted layers; nitrogen fixation and high nutrient recycling; Can be mixed with oats, rye, millet, sorghum, radish and other cover crops species.	3 – 6 tons/ha	Knife-roller when the plants are on the second to third flowering stage, slash, herbicides.

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<i>Lupinus angustifolius</i>	Blue lupin – IAPAR 24	15-20	20-50	Cold	Grows in soil with low/ medium fertility; good soil cover; the good root system can break compacted layers; nitrogen fixation and high nutrient recycling; It can be mixed with oats, rye, triticale, millet, sorghum, radish and other cover crops species.	3 – 6 tons/ha	Knife-roller when the plants are on the second to third flowering stage, slash, herbicides.
<i>Vicia sativa</i>	Common vetch	18-25	20-40	Cold	Plant exigent in calcium and phosphorus, it doesn't grow in acid soils; good soil cover; high nitrogen fixation and good nutrient recycling; Can be mixed with oats, rye, millet, sorghum and other grasses, radish and other cover crops species. Can be used for animal grazing	2 – 5 tons/ha	Knife-roller at the flowering stage, slash and herbicides
<i>Vicia villosa</i>	Hairy vetch	18-25	20-40	Cold	Wild plant that can grows in very acid and depleted soils, with low content of organic matter, phosphorus and calcium; good soil cover; high nitrogen fixation and good nutrient recycling; Can be mixed with oats, rye, millet, sorghum and other grasses, radish and other cover crops species. Can be used for animal grazing, and re-grows to cover the soil. Long cycle.	3 – 6 tons/ha	Knife-roller at the flowering stage, slash, herbicides.

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<i>Pisum sativum subesp. arvense</i>	Field pea – IAPAR 83	15-25	20-50	Cold	Plant that presents fast growth, develops in soil with medium fertility; good soil cover; high nitrogen fixation and good nutrient recycling; Can be mixed with oats, rye, millet, sorghum and other grasses, radish and other cover crops species. Can be used for animal grazing, re-grows again and can remain covering the soil. The seeds when they are green can be used as human food, for animals the dry seeds must be toasted to eliminate some undesirable compounds.	3 – 7 tons/ha	Knife-roller at the flowering stage, slash, herbicides.