

Sunflower

PRODUCTION GUIDELINES



CROP HANDBOOK

Sunflower

| Production Guidelines | 3 |
|----------------------------------|----|
| Crop Rotation - Crop Development | 5 |
| Tillage | 6 |
| Planting | 8 |
| Crop Protection | 10 |
| Spraying | 11 |
| Fertilization | 12 |
| Hoeing / Harvesting | 13 |
| Machinery | 14 |



CROP HANDBOOK

Production Guidelines

| | SUNFLOWER | | | |
|---|---|--|--|--|
| OPERATIONS | AGRONOMICS AND TIMING | | | |
| Crop rotation | After winter wheat, cereals, sugar beet. Avoid rotations with canola and soybeans. Must be turned every 3 years | | | |
| Primary tillage | Minimum tillage (max 30 cm) • Plough • Chisel • Heavy cultivator | | | |
| Secondary tillage | Harrows, spike harrows, light field cultivators | | | |
| Planting (Northern Hemisphere) | | | | |
| Timing | From 15 march to 15 of may (soil T. 8°C) | | | |
| Population at harvest | 5-6 plants per square meter. Weight of 1000 seeds 50-65 grms | | | |
| Distance between rows | 45-70-75 cm | | | |
| Distance between plants | 30-32 cm (45 spacing between rows) 18-20 cm (70-75 spacing between rows) | | | |
| Depth | 3-4 cm | | | |
| Soil insecticide | At planting in the seeds furrow | | | |
| Fertilizying (Guidelines, to be adjusted on soil analysis base) | | | | |
| Nitrogen (N kg/ha) | 70-90 at planting or 50-70 top fertilization | | | |
| Phosphorus (P_2O_5 kg/ha) | 50 at planting: or 70 before planting; 0 in soils which content Olsen>20 ppm | | | |
| Potash (K ₂ 0 kg/ha) | 0 in good soils 60 in soils with P< 120 ppm | | | |
| Weed and pest control | Spraying, hoeing | | | |
| Harvesting | When grain has a content of 9-10% moisture | | | |



Sunflower fields in Siberia

| SUNFLOWER | PRODUCTION B | SY COUNTRY |
|-----------|---------------------|------------|
| | | |

| Country | (Values in Metric Tons) |
|----------------|-------------------------|
| Ukraine | 12,000,000.00 |
| Russia | 9,500,000.00 |
| European Union | 8,400,000.00 |
| Others | 7,491,000.00 |
| Argentina | 2,800,000.00 |
| Turkey | 1,000,000.00 |
| WORLD | 41,191,000.00 |

United States Department of Agriculture (USDA) estimate. May 2016

Sunflower Production last year was 39.18 million tons.

This year's 41.19 estimated million tons could represent an increase of 2.01 million tons or a 5.13% in sunflower production around the globe.

STAGES OF SUNFLOWER DEVELOPMENT

VEGETATIVE STAGES



(North Dakota State University, Fargo, US)

REPRODUCTIVE STAGES



(North Dakota State University, Fargo, US)

Crop Rotation - Crop Development why is IT IMPORTANT?

- As a Rule, **Crop Rotation** practices improve the performances of crops.
- By varying crops in the same season, farmers can spread equipment demand throughout the season, reducing costs while increasing utilization.
- **Exploitation of soil** fertility is improved, as different crops roots explore different layers of soil and use different nutrients.
- Structure of soils improves, because residues from crop roots stay at different depths and residues are also different; sunflower roots may achieve 2-3 meters of depth, which is not common with other crops.
- **Risks** of sunflower disease will be greatly magnified by short sequencing of sunflower in a crop rotation.

- Sclerotinia or white mold (wilt, stem rot and head rot) is the primary disease concern with a poor sunflower rotation. Improper rotations can also result in Verticillium wilt, Phoma and premature ripening.
- **Rotations** of at least three- or four-year spacing between sunflower or other Sclerotinia susceptible crops (e.g., canola, soybean) are recommended to help reduce disease risk.
- For sunflower, good prior crops are corn, wheat and similar cereals and sugarbeet. It is not suggested replanting sunflower on sunflower, due to building up of diseases. A period of minimum 3 or 4 years is suggested before the crop returns on the same field. Avoid short rotation with soybeans and canola, because these crops have a common fungi disease with sunflower (Sclerotinia sclerotiorum). A period of two years is suggested before planting such crops on the same field.



Sunflower



Canola



Soybean

Tillage

PRIMARY AND SECONDARY

- **Primary Tillage** for sunflower is better carried out at fall. Primary tillage should begin right behind the combine.
- A wide choice of tools are available for **Primary Tillage**
 - Moldboard plow
 - Chisel plows
 - Disk rippers
 - Offset disk
- Pre-emergence herbicides may be incorporated with a tandem disk, chisel or sweep plows, disk harrow, long-tine harrow, rolling harrow, or air seeders with sweeps in different sequences or combinations.
- Disk Rippers are a good option for fall Primary Tillage, as equipment was reinvented with more aggressive residue handling up front, higher clearance, and an array of seedbed attachments on the back.

- Secondary tillage is carried out before planting, ideally one or two days before. The goal is to achieve a proper seedbed ideal soil particles for good contact between seeds and soil. Soil with a rough surface hinders proper seed germination and plant growth, ultimately leading to lost potential yield.
- Large soil clods can cause planter row units to bounce. This makes it challenging to control planter depth and maintain seed placement accuracy for uniform plant spacing.
- A consistent seed bed is important better germination of seedlings
 - A smooth surface improves application and nutrient consistency
 - Plant roots require a balance of water and oxygen from the soil pore space
 - Uniformity of seed bed creates uniform crops reducing plant competition
- The right soil-air-water balance helps plants to establish strong root structure which:
 - Limits plant stress during drought periods
 - Improves plant water and soil utilization
 - Improves crop anchorage

MINIMUM TILLAGE AND NO TILLAGE (NO-TILL)

- Minimum-Tillage production systems use subsurface implements with wide sweeps, such as harrow systems for application and incorporation of herbicides. These production systems leave between 30 percent and 60 percent of the soil surface covered by crop residue after planting.
- **Minimum-Tillage** sunflower production systems rely on a good long-term crop rotation to help control difficult weeds. These systems rely on two incorporations of granular herbicides.
- Planting sunflower in a No-Till production system may require the addition of residue managers to remove a small amount of crop residue from the seed row so double-disc openers can place seed properly. Poor placement will delay or prevent germination, emergence, and establishment of the crop.
- **Poor establishment of crop** may lead to weed, insect and harvest management problems. Single-disc openers and narrow-point hoe openers have been used successfully to seed sunflower.

(North Dakota State University, Fargo, US)

RESULT OF NON-ADEQUATE PRIMARY TILLAGE AND SEEDBED FINISHING



Emergence was uneven and late, resulting in damages from insects, among other problems.

Poor residue management can result in very poor stand establishment and yield.

PONDING

MISCONCEPTION: PONDING IS A RESULT OF TOO MUCH RAINFALL

Not necessarily. Usually ponding is a result of poorly managed soil. When soil is compacted, it cannot absorb water. Compacted soil is like a sponge that is squeezed tight: there is no space for air and water. To make matters worse, compacted soil forms an impenetrable layer that prevents excess water from draining through. The result is ponding.



Planting

- Hybrids available for planting differ in maturity earliness and kernels' oil content and composition. On the base of maturity, hybrids are divided in 5 groups: early, middle-early, middle late and late. Sunflower seeds begin to germinate at a temperature of 8°C. Seeds are sold in package of 70.000-75.000 seeds, which is the rate for one hectare with a weight of 4 to 6 kilograms. Seeds are dressed with insecticide and fungicide to be protected in the very early stage of growth. We suggest a rate of 8 seeds per square meter in order to have 6-7 plants at harvesting time: This rate is ideal for fertile soils with a good moisture content during the season. In worst soils the rate would be 5 plants per square meter at harvesting.
- Sunflower yield components are:
 - 1. The number of heads per hectare.
 - 2. The number of kernels per head.
 - 3. Average weight of kernel.
- Because cropped sunflower produces only a head per plant, the number of plants per hectare is the most important factor for production.
- Commonly sunflower is planted with ann interrow spacing of 70 or 75 centimetres. reducing spacing down to 40-45 centimetres can increase yield of 10-20%, specially when planting hybrids of low size (not tall).

UNIFORMITY IS CRUCIAL IN SUNFLOWER CULTIVATION

- Uniformity in sunflower emergence is an extremely important factor for high yield results. Uniformity enables productive plants to utilize available resources without competition.
- Plants that emerge uniformly and progress at the same rate of development throughout the growing season – also known as "photocopy plants," – deliver improved yield potential. Two bad plants will not produce the same yield as one good plant.
- Uneven emergence introduces inefficiencies and adds competition within the stand. Larger, early emerging plants obtain a greater proportion of available resources (light, water, nutrients) than smaller, later-emerging plants.
- Even emergence and development of crops makes possible even ripening and easier harvesting
- Seeding rate of 7 seeds per square meter should allow to produce 5-6 plants at harvesting, which is considered optimal in a wide range of cases.



SIX PRIMARY AGRONOMIC DRIVERS OF SEED PLACEMENT ACCURACY

Producers should consider **six agronomic** drivers of seed placement accuracy at planting time. Depending on the type of seed and field conditions, certain drivers may have more or less importance:

- 1. Proper and accurate seed depth
- 2. Uniform and accurate seed depth throughout the field
- 3. Good soil-to-seed contact

- 4. Uniformly correct soil pressure all around the seed
- 5. Accurate seed population
- 6. Accurate in-row seed spacing

EMERGENCE OF CROP

CRUCIAL FACTS

- Early, even emergence is one of the most critical elements to attaining maximum yield potential from all crops. The sooner the plant gets out of the ground, the sooner it can develop a more advanced root system and leaf stage to fight off stress factors that are sure to come its way.
- The sooner plants get out of soil, the less they will be damaged by soil pests. Also, fast emergence is a good way to avoid fungal damage.
- Plant uniformity is also crucial to good, healthy stands. Plants have the ability to reach 100% productivity if they are all at the same growth stage at the correct time of year.
- **Double or triple plants** compete with each other and cause yield loss. This is also the result of uneven plant spacing caused by planter bounce due to poor seed bed smoothness. That is why it is so crucial to smooth the seed bed according to soil type and the crop to be planted.

SEEDING RATES AND DEPTH CONSISTENCE

- A Consistent Stand: Uniform emergence thanks to proper seed rate and seed depth.
- **B** Almost Consistent: Sufficient stand.
- **C** Not Consistent: Stand suffers from poor emergency due to either planter bouncing or incorrect setting occurred.



Crop Protection

- Weeds can heavily damage sunflower during the whole season, most common weeds being dicotyledons like Chenopodium spp, Sinapis spp, Anagallis arvensis, Polygonum spp, Solanum nigrum, Ammi majus and Abutilon theophrasti and grasses like Echinochloa crus galli, Setaria spp, and Digitaria spp.
- Competition of weeds particularly in the first 4 weeks of growth can reduce yield up to 65-70%. Herbicides' pre-emergence application are mostly common for broadleaf control: the success of this applications depends on soil moisture content: in dry weather, this applications are not so efficient.
- Post emergence sprayings are common for grasses control and do not depend on moisture. Before the closing of the rows, hoeing is very useful for destroying weeds escaped to chemical control. Volunteer sunflower is itself a though weeds in other crops, however an array of herbicides is available to clean field planted with sugarbeet, wheat, corn and soybeans in rotation with sunflower.



Chenopodium Album

Polygonum Spp.

Solanum Nigrum

DISEASES' AND INSECTS' CONTROL

- Sunflower can host several fungi diseases, but luckily resistant hybrids to most common diseases (Phomopsis, Sclerotinia and Phoma) are available. When necessary, fungicide application are possible but then sprayer must have a sufficient clearance in order to operate on the top of the crop.
- **Insects control begins at the planting** with granular insecticide applied along the furrows. Only if necessary, insecticide spraying is carried out later with high clearance sprayers.

Spraying

FACTS

- **Crop protection** is of paramount importance, whatever the crop pattern are. The less tillage is applied, the more chemical control of weeds becomes crucial.
- Weed control is carried out both with pre-sowing, pre-emergence and post-emergence (on-top spraying). Weeds can damage the yield up to the 100%, if not controlled or controlled to late.
- When **spraying** is needed, timeliness is more crucial than in other operations. Weeds and pests are to be hit in right time and with precise doses of chemicals.
- **Productivity and reliability** are important factors that affect the result of spraying operations, as well as accuracy in application rates of expensive chemicals.
- **Uniform droplet size** helps to produce consistent canopy coverage and the desired pest prevention.
- Adjustments of pressure and volume are required depending on what our target is (weeds, fungi, insects).
- Drift control is another important factor.



DROPLET SIZES FOR DIFFERENT CHEMICALS



Droplet sizes are suggestions for each pesticide. ¹ Based on VDO.5, the Volume Master Diameter (VMD) designation. Source: Kansas City University. ² Revision of Stantard S-572.1 also includes extra-fine and ultra-coarse categories for non agricultural users. This droplet guide summarizes suggested droplet sizes for a variety of chemicals, based on the ASABE standard droplet spectrum categories.

Fertilization

- As for all crops, **only soil analysis result can precisely suggest a fertilization strategy** for each field and each crop, also depending on prior crop and rotation of crops. However, some quidelines are possible and reliable.
- A yield of 3.5 tons per hectare removes from soil 155 kg N, 67 kg P_2O_5 and 255 kg of K_2O . On average residue of sunflower returns to the soil 50 kg N, 15 kg P_2O_5 and 200 kg K_2O . The deficit is then N 105 kg per hectare, P_2O_5 52 kg per hectare and K_2O 35 kg per hectare. On this base, a possible fertilization strategy can be:

FOR SUNFLOWER

| ELEMENT | |
|---|---|
| Nitrogen (N) | 80 - 100 kg per hectare, of which 30% pre planting and 70% at hoeing |
| Phosphorus (P ₂ 0 ₅) | 70 kg per hectare pre planting or 50 kg per hectare along the furrow at planting; only in deficient soils, 100 kg/ha |
| Potash (K ₂ 0): | 0 kg per hectare;only in very deficient fields, 100 kg per hectare in pre planting |
| | |

• Boron (B) can be an issue in sunflower. Main symptom is a shrinking of leaves. In this case, foliar application is possible when the sunflower shows 8 pair of leaves (V8 stage).



Hoeing

- **Conventional tillage plans** may include the option of row cultivation once or twice during the early growing season before the sunflower reaches a height too tall for cultivation. This can be used with or without pre-emergence or post-emergence herbicide.
- A rotary hoe or harrow can be used just before sunflower emergence and/or at the V-4 to V-6 development stage. Harrowing or rotary hoeing between emergence and the V-4 stage can result in injury or death of the sunflower plant. Depending on planting depth and stage of crop development, stand losses are generally less than 5 percent if the sunflower crop has at least two fully expanded leaves.
- **Proper adjustment** of the harrow or rotary hoe will maximize damage to the weeds and minimize injury to the sunflower crop.



Sunflower V4 stage

Harvesting

- Harvesting traditionally begins between September and October when moisture content reaches an ideal 9-10%.
- It is possible to begin harvesting from a 25% moisture content level if drying facilities are available. This practice is not recommended as Sunflower burns easily and there is significant risk for crop damage.
- A dedicated header with catch pans is essential to avoid heavy losses of heads.
- Desiccants can be applied to the crop after it reaches the physiological maturity to speed the dry-down process. The chemical compounds act much like a frost to kill the green tissue on the plant and accelerate the drying process.

Machinery IMPLEMENTING YOUR GROWTH PROJECTS



NEW HOLLAND ST830

Chisel Plow

New Holland ST 830 Chisel Plow can perform a proper primary tillage for sunflower in a conventional farming system.



NEW HOLLAND TRACTORS SERIES

New Holland has a huge legacy in manufacturing agricultural tractors, which are used in all conditions and on all crops. New Holland tractor Series, starting with T5 Series up to T9 Series, offer to our Customers a wide choice of units with the necessary configurations combined with the right powers for all operations.



NEW HOLLAND GUARDIAN SPRAYERS

Sprayers

It's all about doing more with less time. Guardian[™] front-boom sprayers cover ground faster, reduce downtime and maximize acres sprayed per hour. These sprayers offer the highest horsepower, largest tank size, and the smoothest suspension combined with the highest ground clearance and the tightest turning radius in the industry to maximize your spraying productivity and quality.



NEW HOLLAND COMBINES

New Holland combines series TC, CX and CR offers a wide choice of equipment to perform an efficient sunflower harvesting. From simple conventional combines TC up to extra productive CR twin rotor combines, tradition and technology at New Holland are the fundaments of a successful story.





Visit our website: www.newholland.com Send us an e-mail: international@newholland.com

AT YOUR OWN DEALER



The data indicated in this folder are approximate. The models described here can be subjected to modifications without any notice by the manufacturer. The drawings and photos may refer to equipment that is either optional or intended for other countries. Please apply to our Sales Network for any further information. Published by CNHI INTERNATIONAL SA. Brand Marketing and Communication. Bts Adv. - 09/16 - (Turin) - **AP5711N/INB**