Introduction to the General Principles of Agro-Processing:

Faced with the current economic realities, farmers worldwide are searching for new options of surviving, as well as expanding their business. One of the many opportunities to grow markets, turnover and profits, is by adding value to farm produce through further processing. Most value-added food products available to consumers have been processed in some way or other, even if the processing is as simple as cleaning produce before it is packed in plastic- or net bags. Two types of processing methods may be performed on raw materials:

- **Primary Processing**: this type of processing includes the simplest of processes such as washing, peeling, chopping, ageing, the milling of wheat for flour production, and the processing of sugarcane;
- **Secondary Processing**: this type of processing involves the conversion of primary processed products into more complex food products and includes procedures such as mixing, depositing, layering, extruding, drying, fortifying, fermentation, pasteurisation, clarification, heating etc.

Agro-Processing of Oats and Maize:

- **Oats**
  - **Rolled oats** is the main end product of any oat processing plant. It is produced by flattening groats (de-hulled oats) between rolls under heavy pressure. The groats may be cut prior to rolling to achieve rolled end products of varying thickness. Rolled oats is consumed as a hot breakfast cereal (porridge) that requires cooking.
  - **Oat flour** is the milled, flour product from hulled oats and is used in baked products, granola bars and ready-to-eat breakfast cereals. It is especially valuable in infant foods due to the high nutritional value and low allergenicity and pleasant flavour. It is widely used as one of the first solid foods introduced to babies or as thickener in various commercial infant products.

- **Maize**
  - **Alcohol from maize**: Alcohol is produced through a yeast fermentation process. Starch is firstly converted to sugars and the sugars are then converted to ethanol and carbon dioxide in the presence of water by the action of specific yeast cultures.
  - **Baked, extruded maize snacks** are essentially the same as their fried counterparts, but has a much lower KJ content since they are dehydrated by baking instead of frying.
  - **Flaked maize cereal (Corn flakes)** is a ready-to-eat breakfast cereal that only requires the addition of milk. The basic objective in making flaked cereals is to obtain grain grits from the whole grain that would each produce a flake.
  - **Fried, extruded maize snacks** are manufactured through extruding moistened maize meal under high pressure and temperature conditions. The puffed product is then fried and usually coated with a savoury flavour such as cheese or onion.
  - **Magou (medium scale)** is a traditional sour maize beverage of South Africa. It contains little or no alcohol, but has a pH of about 3.5.
  - **Maize chips and snacks** are manufactured using an extrusion-based process similar to that of puffed maize snacks. They are cooked at relatively low temperatures and then sheeted out, cut into shapes and fried.
  - **Maize oil**: The maize germ contains 34 – 52 % oil. The oil is extracted firstly by physical separation of the germ from the kernel, and then chemically by means of solvent extraction. The oil is refined by various treatments to produce edible oil of high quality that can be used for frying and baking.
  - **Maize starch**: The starch fraction of the maize kernel is extracted through wet milling, sieving, washing and centrifugation. The final starch slurry that is free of the fibre and protein fractions is dried and packaged in powder form. Dry native starch and all its modified forms have endless applications in processed food products as well as various industrial sectors.
  - **Maize syrups or glucose sweeteners** are manufactured from the starchy endosperm of maize by using a conversion process known as hydrolysis. The hydrolysis process can be chemical (by means of strong acids) or enzymatic or a combination of the two. Various types of maize syrups can be produced, depending on the processing conditions and hydrolysis agents used.
Masa flour is produced by drying and grinding lime-cooked maize kernels. Mealie meal (small scale) is the staple food of a large proportion of the South African population. It is mainly used for the preparation of traditional thick or thin porridge. Puffed maize cereals are extruded, ready-to-eat breakfast cereal made from maize meal, starch, sugar, salt, malt and added colouring. It comes in a variety of interesting shapes, sizes and flavours. Puffed maize snacks are cooked and shaped by an extruder, but puffed by a separate process step such as frying or hot air puffing. The extruded product is partially dried prior to puffing and can be held in this form for long periods for easy distribution or storage, and later puffed in the same plant or by decentralised, smaller food processors. It can also be sold directly to the consumer to be fried at home, in restaurants, etc. for immediate consumption. Tortillas and Tacos are flat circular, light coloured bread, about 1 - 3mm thick and 15 - 30cm in diameter. Tacos are tortillas that are allowed to undergo starch degradation and is then formed into a “U” shape and fried. It is a crisp tortilla filled with seasoned beef, lettuce and cheddar cheese. Tortillas make superb alternatives to bread, pitas muffins and crackers. Popcorn is a summer crop that is harvested in autumn and is planted in the same way as field corn/maize. Popcorn kernels range in colour from off-white, light golden, red, black and many colours in between. The specific variety planted should suit the area, climate and intended processing options. It is a known fact the hybrid variety used has a big influence on the popability of the popcorn, for both conventional and microwave popping.

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The manual on the Agro-Processing of Cereal Crops Vol. 1 contains complete information on the products discussed above as well as many other processing methods and products available to the dairy processor and is available from the ARC – Institute for Agricultural Engineering. Contact: Elmarie Stoltz, 012 842 4017, stoltze@arc.agric.za.