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UNDERSTANDING AGRICULTURAL TECHNOLOGY THROUGH COMPARISON OF SPECIFIC TOOLS AND IMPLEMENTS

Le flux d'informations entre les collections et les visiteurs est-il à sens unique? Comment modifier la situation passive des visiteurs? Comment arriver à une approche autonome dans le subconscient des visiteurs? Le large éventail de points de vue comparatifs présentés lors de l'exposition des collections peut être un appui efficace. Les principaux moyens d'étude des collections consistent à présenter le point de vue susmentionné, définir le contexte historique et les caractéristiques fonctionnelles de la collection individuelle, développer une explication plus sophistiquée sur le rôle de la collecte individuelle parmi l'ensemble du système de l'agriculture.

Introduction

Visitors view collections and panels of exhibitions and move on, and information often flows one way: from collections to visitors. How can the interaction between visitors and collections of viewers 'moving on' and information 'coming in' be achieved?

One answer may be comparison: the differences between similar artifacts and connected subjects matters can be amazing. By demonstrating how to compare among similar circumstances in different areas and regions, the exhibition of specific tools and implements will give visitors abundant understanding and greater knowledge. The comparative aspects make visitors aware of developments around the world.

This paper presents the concept with a concrete example: the stripping process for removing grains and balls.

Stripping Process of Removing Device

The removing procedure is a series of actions (beating, pressing, grinding and stripping) by external forces that causes abscission layer fracture. 'Threshing' is used with the overall meaning of removing procedures, not its original meaning of beating, pressing and rubbing grains from the husk. The word 'stripping' is used in two ways: the procedure of removing grains from the head and the harvesting operation of reaping the heads from standing crops.

The instrument, a comb-like array of teeth of certain slit widths was used for removing rice grains and flax balls. By pulling the sheaves of rice paddy or flax through the comb, grains or balls are restrained by the teeth and removed.

The rice stripping instrument of teeth array (Fig.1) was developed in 1690s. It originated in mediaeval Japan: a pair of chopsticks, koki-hashi, with which a person stripped grains from the head while grasping the stalk with the other hand. The flax stripping instrument (Fig.2) was used for a long time. Those processes were unique compared with the common process known

as 'threshing' for wheat, barley, rye, etc. [for further description on the historical background, see Appendix]. The adaptability of the two processes, 'stripping' and 'threshing', is understood from crop science and mechanical engineering viewpoints. Rice grain is borne by a pedicel on a branch and a flax ball is borne by the branch. Grains and balls are not close to one another. On the other hand, the grains of wheat, barley and rye are borne directly on rachis and are in close contact with one another. In the stripping process, the pulling force is directly applied on rice grain or flax balls, and for wheat the force is distributed to neighbouring grains. In the threshing process, the force acting on the bundle of rice paddy or flax is absorbed by the deflection of branches and pedicel*. On the other hand, the random combination of beating, pressing and rubbing forces causes independent slip of grains and abscission.

* This is characteristic of Japonica varieties (hard shattering), not of Indica varieties (easy shattering) which is processed by a common threshing machine.

When the information on each crop and removing process together with certain technical exposition is communicated, people will be amazed by the unusual crops and the implements of similar shape. People in one area are not aware of other devices or crops existing in other regions. People in wheat cultivating areas will also be amazed when they see both the removing process and crops that are different from wheat.

Expansion of Comparison

The comb shaped teeth array device was used in latifundium of Ancient Rome, vallus, described in "Naturalis Historiae" by Plinius, carpentum in "Opus agriculturae" by Palladius and in "De Re Rustica" by Columella. Those were the two-wheeled animal-driven carriers on the front edge of which the teeth array device was attached. It was used for reaping the heads of millet. Millet grain is borne by a small pedicel on a branch but in a cluster; thus the stripping process has the effect of mainly reaping head more than of removing grain (less head loss in the field operation).

The idea of that reaper inspired the rotating combs reaper proposed by William Pitt in 1787 (Fussell, 1952). It was composed of rotating combs arranged on a cylinder driven through a speed increasing gear and a belt-pulley train and powered by an animal driven ground wheel. That was apparently the 'impractical' use of 'mechanized' carpentum.

The monumental relief of valulus was discovered in 1958 at Montaubau-Buzenol, Southern Belgium. This relief was defined as a complement to the other half of the relief found in 1854 at Arlon of which details were vague because of damage. This was monumental evidence shedding light on the description in Roman literature. Discussions on the reconstruction of carpentum became the object of interest in the field of agricultural engineering (Schweigman, 1962). In 1984 the successful stripper harvester was developed by Silsoe Research Institute UK and commercially produced by Shelbourne Reynolds Engineering Ltd. This machine was evolved from precedent implements including ancient ones, and designed with contemporary engineering. Diffusion of the machine stagnated, however, because its performance was sensitive to machine setting, climate conditions and the requisite two-stage process of reaping and threshing.

Concluding remarks

Strange and curious objects arouse one's curiosity or elude one's consciousness. When the strange is comparatively presented with the familiar, more people will be interested. When visitors are offered means of comparing different objects, they are more interested and active. Such comparative exhibits will stir up more curiosity in museum visitors hoping to find new and unusual artefacts, and will increase interest in agricultural technology and the historical background of the technology.



Fig.1 Rice Stripping Instrument, Samba-koki. Reproduction of operation, 1982, photo by Shiroshi Satoh.



Fig.2 Flax Ball Stripping Instrument, shown at an exhibition in the Szreniawa Museum, Poland



Fig.3 Head of Rice Paddy

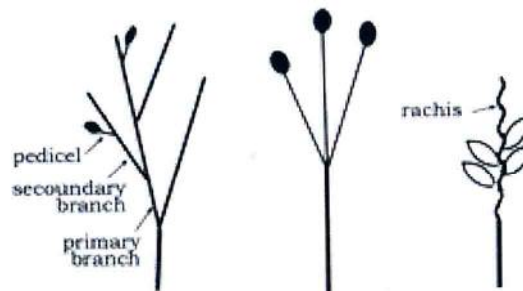


Fig.4 Bearing and Head in Rice paddy, Flax and Wheat

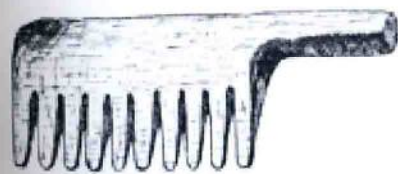


Fig.5 Ancient Roman tool, pecten for removing flax ball (K. D.White, 1967)

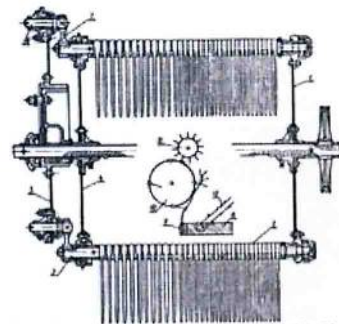


Fig.6 Flax Stripping Machine, Ukraine (A. N. Karpenko, et al, 1968)

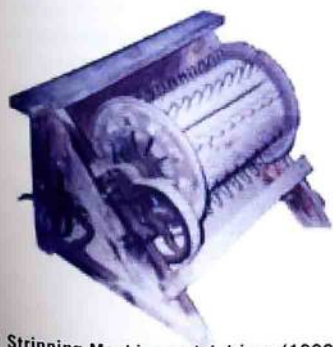


Fig.7 Stripping Machine pedal driven (1900s to 1940s)



Fig.8 Rice Combine, present Japan (Kubota Co. Ltd.)

Such regional and historical comparisons may produce a kind of 'Tourism in Museum': visitors subconsciously tour different areas and regions and view specific collections articulated around certain concepts.

Appendix

The earliest description of the stripping procedure is presented in "Naturalis Historiae" by Plinius. Gallic farmers gather both varieties of millet ear by ear with a comb held in the hand (Leob Classical Library no. 371, p.347). Columella also described the reaping operation done by selecting ripe heads. A comb-shaped tool (Fig.5), pecten, was also used for harvesting flax balls in Egypt and in the northern areas of Africa (White, 1967).

The mechanized flax remover of the indigenous stripping comb (Fig.6) was the successful prototype of the flax-ball remover which consisted of stripping cylinders arrayed with four rotating combs suspended on parallel linkages. The teeth widely and closely spaced along the rotating cylinders were set in the path of the moving stalks (Karpenko, 1982).

Stripping grains in previous ages was done with Koki-hashii, a pair of chopsticks, with which a worker stripped grains from the head while grasping the stalk with the other hand. The speed of work with Senba-koki is not clear from the available literature, but it is estimated at three to ten times that of the older tool, Koki-hashii. Nonetheless, the new instrument solved the labour shortage at that time (Horio, 1974).

The generic mechanisms for removing rice grains by stripping were put to the test during decades of the 19th and 20th centuries in Japan. The basic machine of the head-feeding type thresher was developed as the result of the trial process, and an application for a patent was lodged in 1910 (Fig.7). The fundamental function of stripping was incorporated into the present combine (Fig.8).

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