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EMPLOYMENT GENERATION THROUGH STIMULATION OF SMALL INDUSTRIES

A Pictorial History of the Development of an Improved Chee-ke



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A PICTORIAL HISTORY OF THE DEVELOPMENT
OF AN IMPROVED CHEE-KE

by

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Table of Contents

	<u>Page</u>
Foreword	i
FARM ROAD STRUCTURES IN DIFFERENT AREAS	1
Flat Areas	1
Hilly and Mountainous Areas	2
TRADITIONAL WAYS OF CARRYING GOODS IN RURAL KOREA	4
RESEARCH METHODOLOGY	8
THE MODEL DEVELOPMENT PROCESS	9
Model #1	9
Model #2	10
Model #3	11
The Major Field Interview Survey on Model #4	13
The Comparative Test	16
Model #5	17
Model #6	18

Foreword

This report was produced under the Georgia Tech 211(d) grant from the Agency for International Development titled "Employment Generation through the Stimulation of Small-Scale Industry." However, the actual applied research and development involved in the project was conducted by Soong Jun University (a Georgia Tech counterpart institution) in part under a grant from the Asia Foundation. The support of the Foundation is gratefully acknowledged.

The report deals with the development of an improved version of the Korean chee-ke (or backpack) used for the transport of goods in rural and urban areas of Korea. It illustrates a methodological approach to the selection and design of an appropriate technology in the materials-handling and transport field. Conceptual design is followed by prototype construction, field testing, modification and adaptation, and finally, the development of a commercially feasible model.

The final model holds promise of greatly reducing the physical effort required to transport goods in Korea. Moreover, as one would hope for in a good appropriate technology design, there appears to be a potential for widespread utilization of the commercial version in Korea.

We believe this project is a worthy addition to the appropriate technology field and commend Soong Jun University on its initiative in this activity.

Ross W. Hammond, Director
Office of International Programs
GEORGIA INSTITUTE OF TECHNOLOGY

FARM ROAD STRUCTURES IN KOREA

Flat Areas



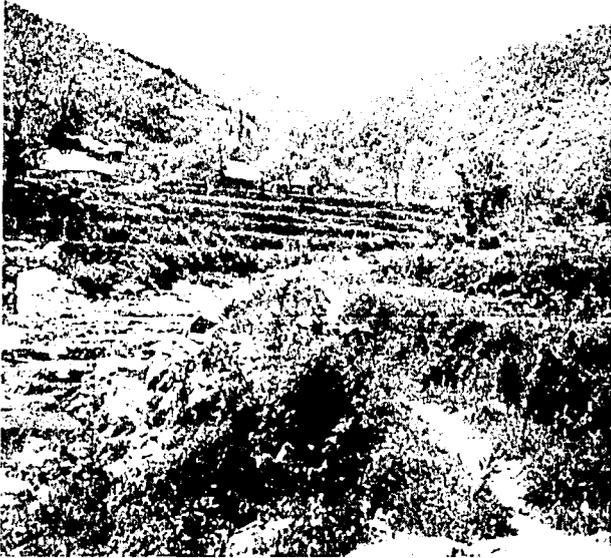
A Korean farm road's function is not simply to be a surface upon which agricultural equipment and materials can be carried, but also to be a property boundary and an irrigation controller. In rural areas, irrigation ditches are very important. Here, rocks have been placed in an irrigation ditch. The farm path can be broken up by removing the rocks, or it can be remade by replacement of the rocks according to irrigation or drainage needs.



Usually farm roads in flat areas are better than those found in other kinds of terrain. This road has been somewhat modernized by the construction of a bridge. Often, however, the farmers do not build a bridge at the intersection of a farm road and an irrigation ditch because of the need to be able to open and close the ditch for purposes of water collection and drainage.

Hilly and Mountainous Areas

Generally, the cultivable areas of Korea are partially located in mountainous terrain. Farm roads in these areas are narrow, meandering, and inclined.



Korea's terrain also is rocky. This road passes over many rocks.





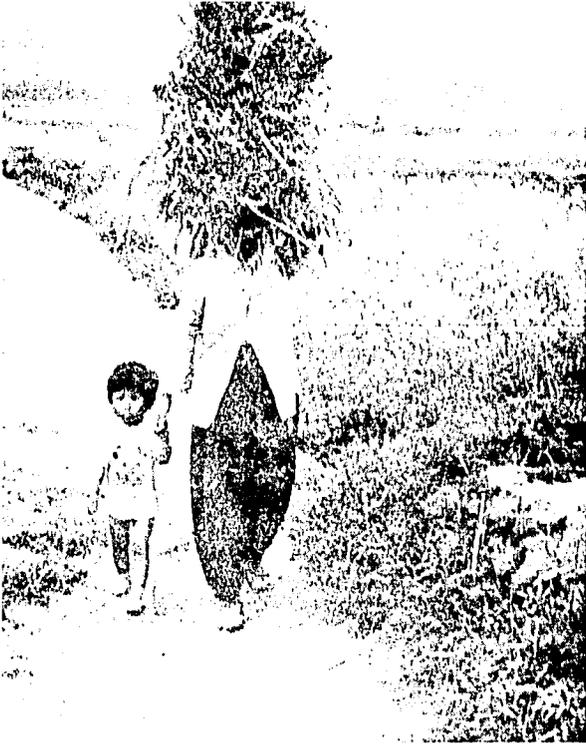
In Korea's hilly regions the land is terraced. The two farm paths in this picture enclose an irrigation system. The width of these roads is variable, and the shape of their surface is high in the middle and low on the edges.



In the rural areas, mountains are important as a source of flammable materials. This road, which leads to a mountain, has forest products such as mushrooms, wood, persimmons, and chestnuts carried upon it.

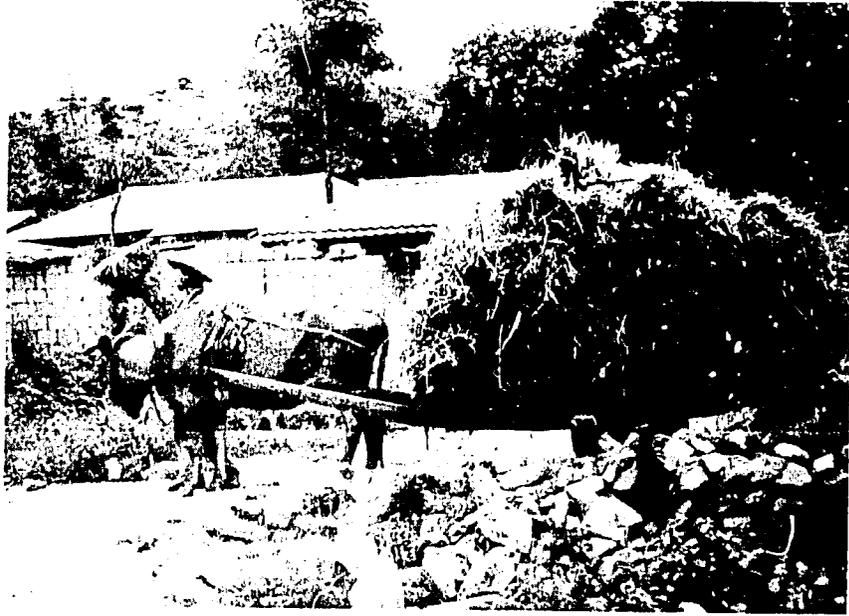
TRADITIONAL WAYS OF CARRYING GOODS IN RURAL KOREA

It is very common in Korea for the rural female to carry a heavy load such as a bundle of straw on her head. Some loads are so heavy that the help of another person is needed to remove the burden from the carrier's head.



This woman is carrying food for her family and hired laborers working in the field. This is an important job for the rural female during the peak season.

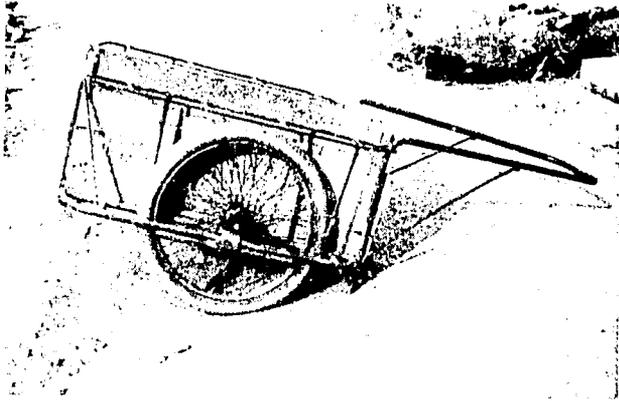




The ox-drawn cart has been in common use in the rural areas of Korea for several hundred years. Only a limited number of relatively well-to-do farmers own carts like this one. The majority of Korean farmers cannot afford them, due to the high cost of the cart and ox.



The wide span between the two wheels of this type of cart limits its usefulness in the rural setting. The axle width prevents its use on the narrow and curvy farm paths.



Another means of transportation commonly used in both rural and urban areas of Korea is the rear cart. It is generally used to transport grain or fertilizer.



The farmers prefer the rear cart to the chee-ke because it is more convenient and efficient. One man alone usually is unable to pull the rear cart, so two men together operate it. The distance between the wheels makes it too big for use on some of the small, narrow farm roads. It also is difficult to use in hilly terrain, and it is expensive.



The chee-ke, a simple pickup baler carried by one man on his shoulders and back, has been playing a critical role in farm transportation for several hundred years. Generally, the young people in rural Korea do not like to use the chee-ke because psychologically it makes them feel degraded.



The chee-ke is still used, however, not only by rural workers, but also by self-employed urban laborers, without any technological improvements having been made upon its parts and structure. Rural youths carry an average of 60 kilograms at a time and travel five kilometers in a day. Based upon careful observations, it was found that older users of the chee-ke outperformed the younger people. This was due to the older persons' skill, even though the younger individuals had greater physical strength.



The traditional chee-ke is very inefficient, difficult to handle, and very heavy when it is fully loaded. Nevertheless, in light of Korea's hilly and rocky terrain, this piece of equipment can hardly be discarded.

RESEARCH METHODOLOGY



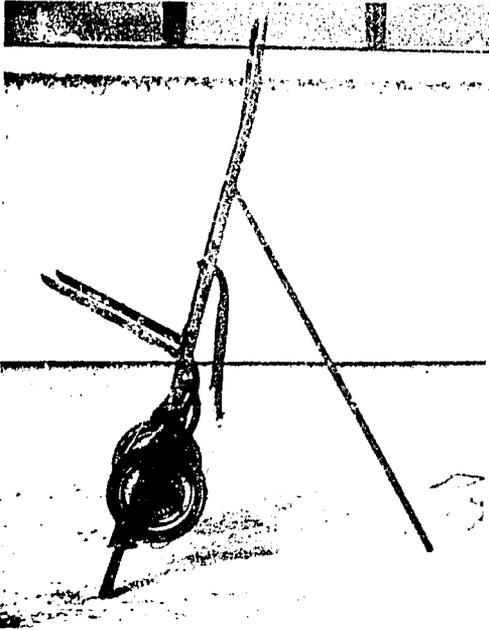
A research team was organized by the Regional Development Institute of Soong Jun University at Taejon to develop a practical, laborsaving alternative to the traditional chee-ke backpack. The team included farmers as the practical users of the chee-ke, rural blacksmiths, specialists in farm equipment, chee-ke makers, mechanical engineers, and professors in the fields of management science, agricultural economics, and mechanical engineering.



The purpose of the research team meetings was to set the direction of the research and to develop designs for improved models. Based on the conclusions that were formed during the research team meetings, different new models were developed and taken to the villages for trial and testing.

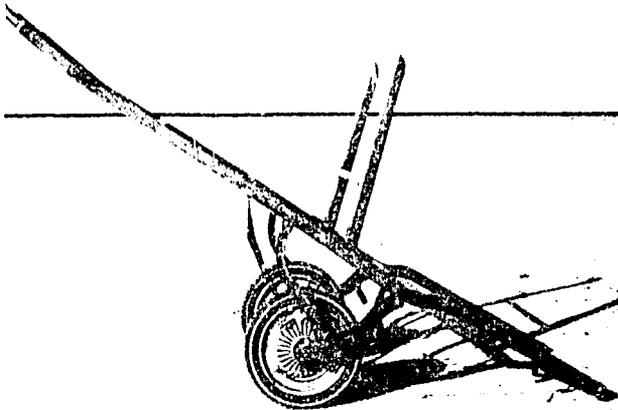
THE MODEL DEVELOPMENT PROGRESS

Model #1



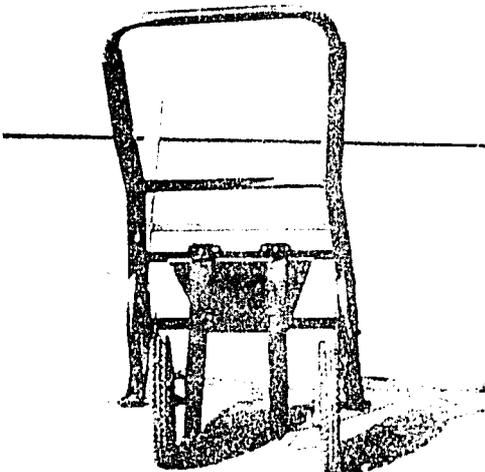
The first model was developed through five research team meetings and two field surveys. It was developed on the basis of the following criteria:

- a. It should be able to accomplish the functions of the chee-ke and the rear cart.
- b. It should be able to operate under the farm path conditions in Korea.



The research team took the new model to the village to examine its structural feasibility. The farmer-users pointed out the following problems:

- a. It is difficult to pick up the chee-ke because the acute angle formed at the junction of the frame and the "H" support is too large, so the carrier is pulled over backwards.
- b. The shoulder straps are attached too high on the frame, so the chee-ke does not fit comfortably upon the shoulders and back of the carrier.
- c. It is unbalanced; the position of the folding "H" support is too low.
- d. The distance between the wheels is too wide for use on a small path.



Rural youth prefer the new model to the traditional chee-ke. Interpreting this fact, it seems that rural youth think that the new model is a kind of farm machine, but that the traditional chee-ke is a relic.

Model #2



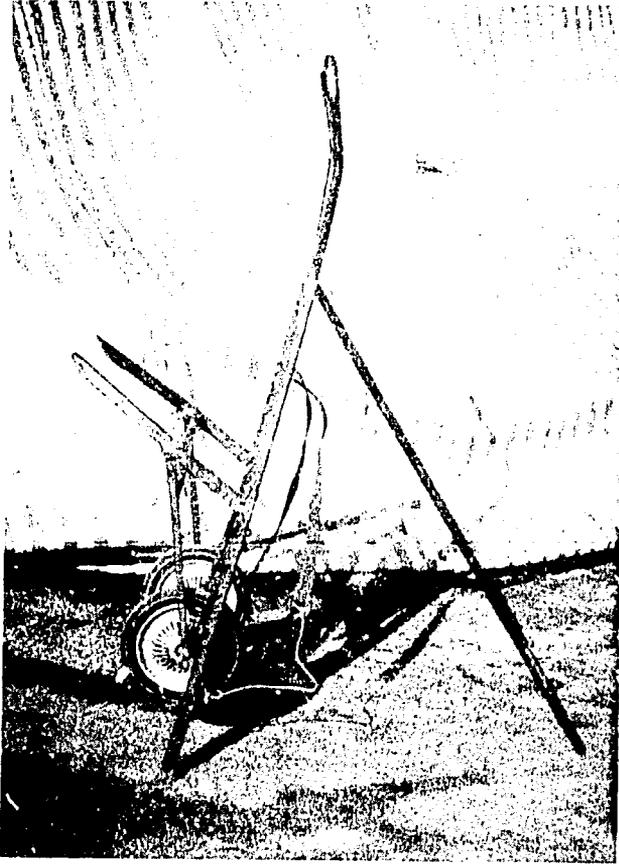
The research team thought that Model #1 was too complex for use by rural people, so they developed a simpler model. The team took Models #1 and #2 to the village at the same time. Interestingly, all of the farmers preferred Model #1 because they thought Model #2 was almost the same as a chee-ke except that it had wheels attached to the frame.



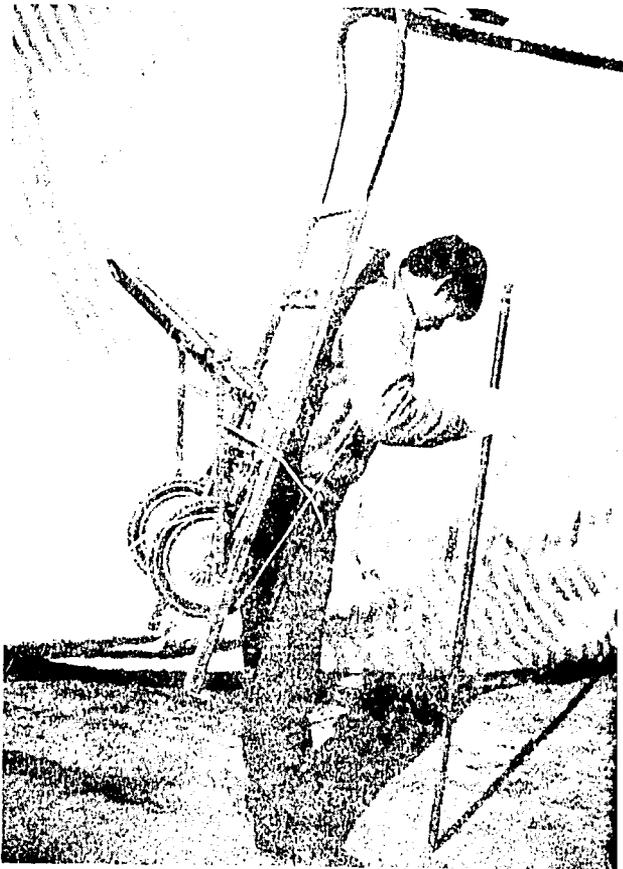
To unload the cargo from the new model, the carrier, with the chee-ke still on his back, tips the frame to one side, allowing the cargo to fall out of the chee-ke. Model #2 is dangerous, therefore, because when the carrier tips the frame over, the wheel will press against the carrier's body.

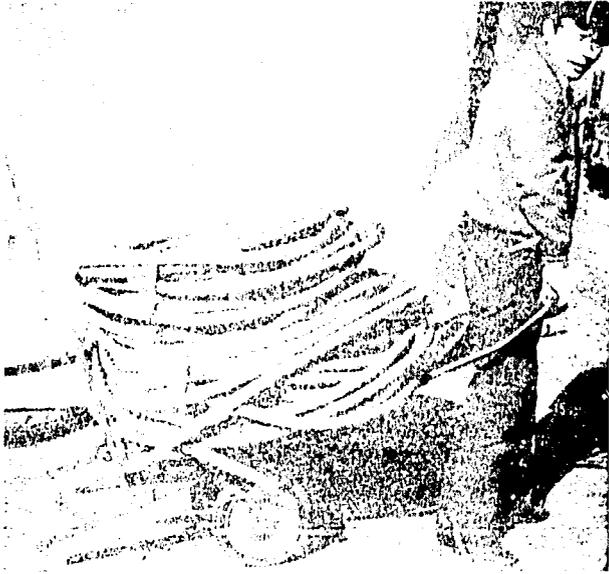
Model #3

Based on the results of the above-mentioned surveys, the research team developed Model #3.



They attached another support, called the lower support, to the frame and "H" support, increased the distance between the wheels, and made the top of the frame into a handle which can be used for pulling or pushing.





The function of the new lower support is very important. When the farmers use the wheeling system, they unfold the "H" support and the new support downwards. The weight of the load is thus shifted down the frame of Model #3, closer to the wheels. The operators of Model #3 are easily able to balance it.



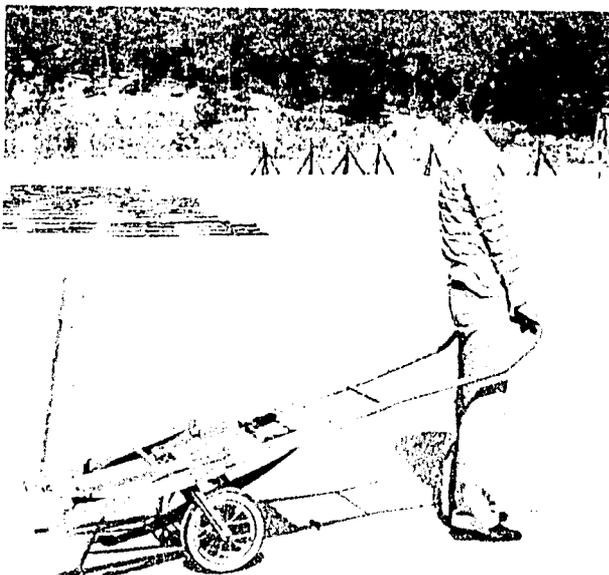
When changing from the carrying system to the wheeling system, it is not easy to shift the weight of the load down the frame because when the "H" support is unfolded downward, the hinge which attaches the "H" support to the frame tends to keep the cargo from moving down the frame so that it can rest against the lower support. The lower support's position should be lowered on the frame so that a larger cargo can be carried when the wheeling system is used.



When the carrier is carrying Model #3 on his back, the handles on top of the frame are high, which is inconvenient. The farmers therefore suggested that the handle length should be made adjustable so that the farmers could use one handle length when they were using the wheeling system and another handle length when they were using the carrying system.

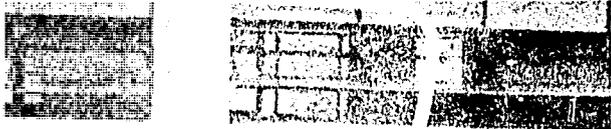
The Major Field Interview Survey on Model #4

Model #4 was developed through several research team meetings and field experiments. The team carried out a major interview survey on Model #4, taking it to three types of villages: those on hilly, flat, and valley-type terrains.

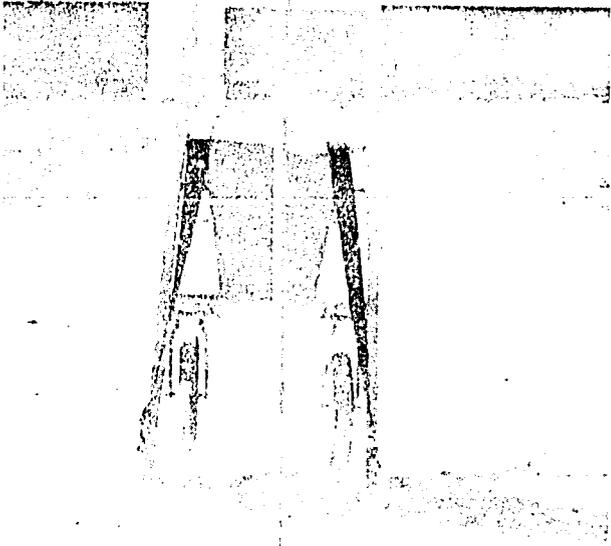


The items covered by the survey were:

- a. The farmers' (users') attitude and response to Model #4.
- b. Comparison of the performance of the traditional chee-ke and Model #4.
- c. Comparison of the performance of the rear cart and Model #4.
- d. The functional feasibility of Model #4.
- e. The structural feasibility of Model #4.
- f. The marketability of Model #4.



It was found, through the field experiments, that Model #4 can be completely substituted for the chee-ke. It is more convenient and efficient than the chee-ke because it can be either carried or rolled, depending on the terrain. Old, weak, or very young people can easily use the new model; therefore, it can help solve the current rural labor shortage.



The weight of Model #4 is somewhat greater than the weight of the chee-ke. However, the advantage of the wheeling system more than compensates for the disadvantage of the extra weight.





When using the wheeling system, the balance of the model is a critical problem because the distance between the two wheels is narrow and the wheels are small. Consequently, Model #4 can easily turn over.



Model #4 has two disadvantages for use in mountainous regions. In these areas, there usually are no roads and the carrier must sidestep his way to his destination. Model #4's base legs are too close together so that when the carrier is sidestepping, he makes contact with the base legs. Also, the handles on top are so long that they strike the limbs and branches of trees.

The Comparative Test

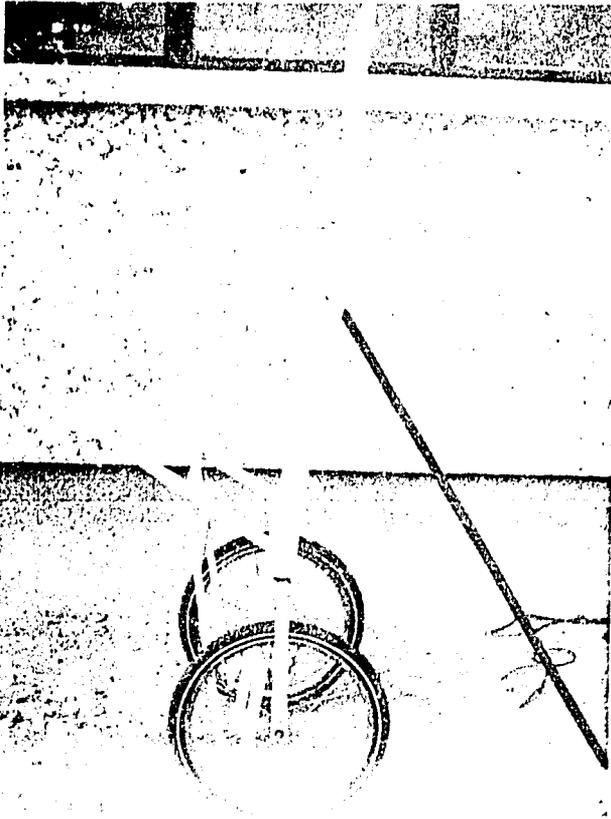


Comparative experiments were conducted using the new model and the chee-ke under given road conditions and load weight. Three people were assigned to carry chee-kes and three people were assigned to the new models. The two types were tested side by side at distances of 1500, 2500, and 3500 meters.

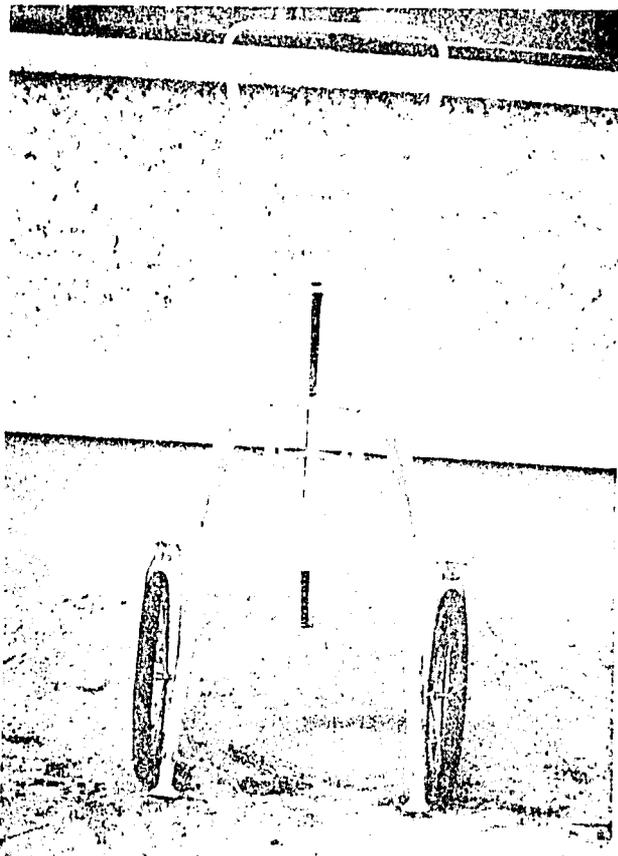


As the distance traveled in the test increased, the distance gap between the chee-ke and the new model also increased. The superiority of the new model was demonstrated. Its wheeling system also reduced the physical hardship on the users.

Model #5



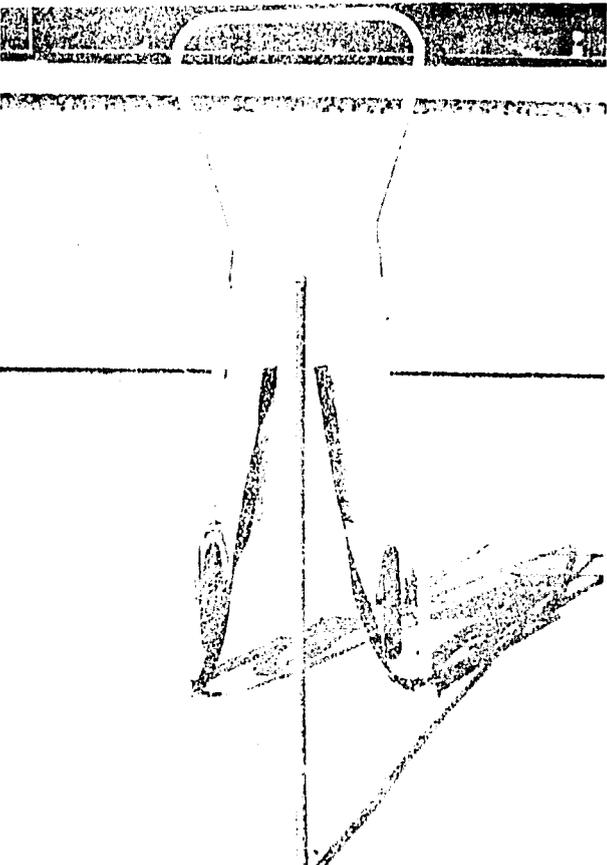
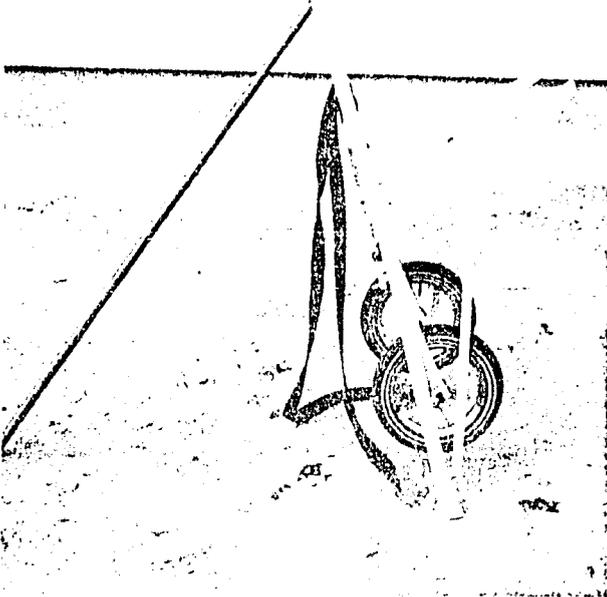
Model #5 was developed based on the results of the major field survey on Model #4. The research team tried to increase the distance between the two wheels and reinforce the hinge that joins the wheel to the frame.



As shown in this picture, the wheels are too large; therefore, this model is difficult to put into practical use.

Model #6

Model #6 is the final model designed in this research. It was developed in the same way as the other models, and is based particularly on the structural and/or functional feasibility of Model #4.

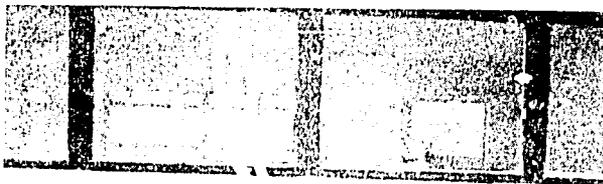


The team had to solve the following problems:

- a. The back support pad was too wide at the base and too curved to fit the contour of the back when it was carried.
- b. The length and width of the frame were so great that it was uncomfortable on the carrier's back.
- c. The distance between the wheels and base legs was too small.



After these problems were solved, the operators of Model #6 were able to keep their balance and walk easily in mountainous areas.



The research team believes that Model #6 is an excellent substitute for the chee-ke and the rear cart. It was suggested that the manufacturers make several kinds of Model #6's. One kind would be especially suitable for use in flat areas, another for hill and valley areas, and still another for mountainous areas.





The diffusion of the new model will generate new employment in the marketing and utilization processes. If the amount of time saved by using the new model, as shown in the test, can be used in other productive activities, then the farmers can increase their productivity and their income as well.